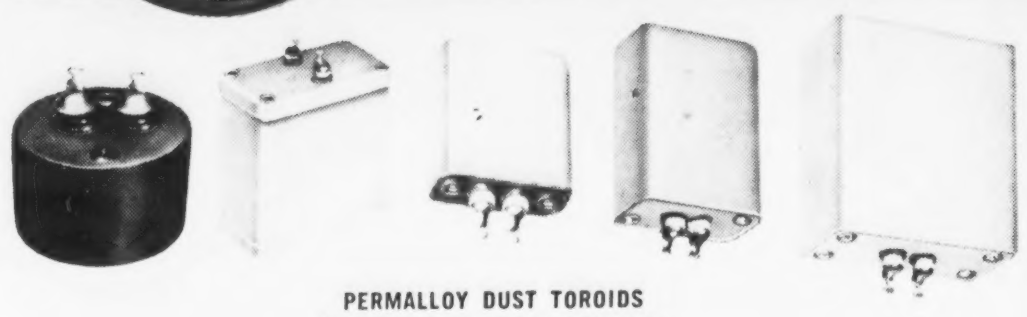
arch-April 1956

Communications—Electronics—Photography

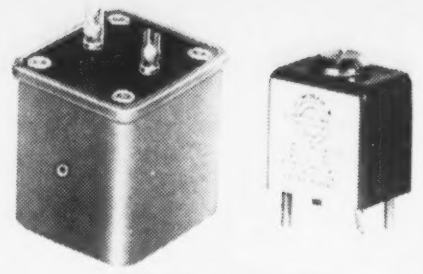
SIGNAL

...FROM STOCK

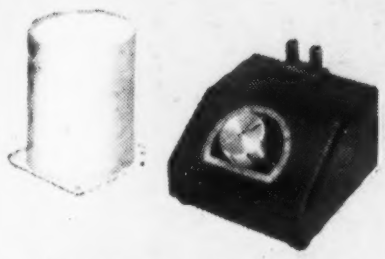
Write for your Copy of Catalog '56



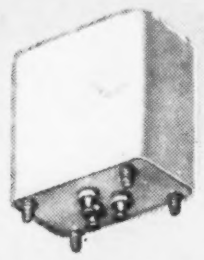
PERMALLOY DUST TOROIDS
Maximum Accuracy and Stability



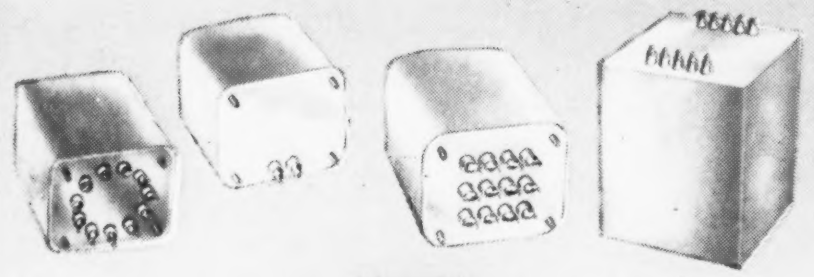
VARIABLE INDUCTORS
Standard and Hermetic



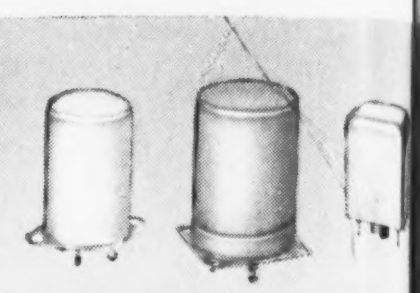
LOW FREQUENCY INDUCTORS and INDUCTANCE DECADES



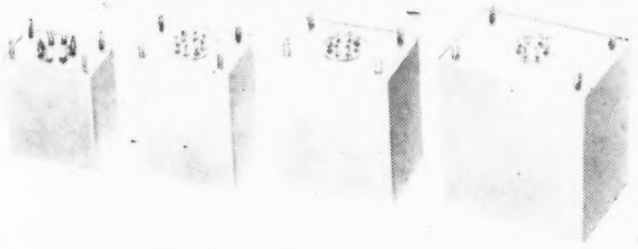
LOW PASS, HIGH PASS and BAND PASS FILTERS . . . HERMETIC



HERMETIC
Power, Plate, Filament Transformers and Reactors

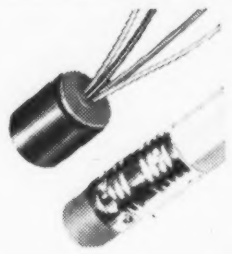


HERMETIC AUDIO COMPONENTS
for Every Application



MAGNETIC AMPLIFIERS . . . HERMETIC

PULSE TRANSFORMERS



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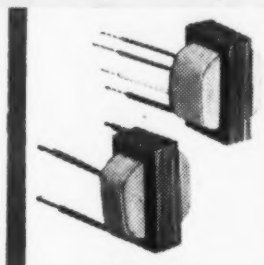
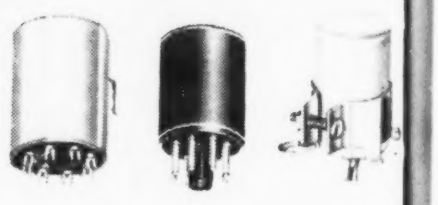
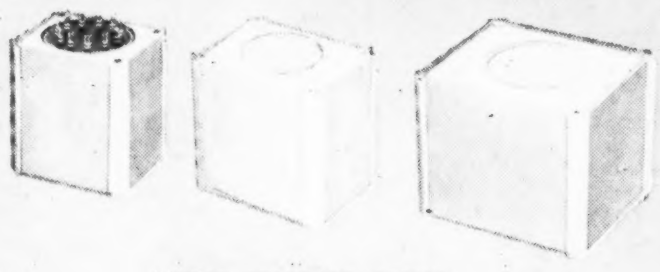
Transistor Transformers
Smallest Size–Highest Power



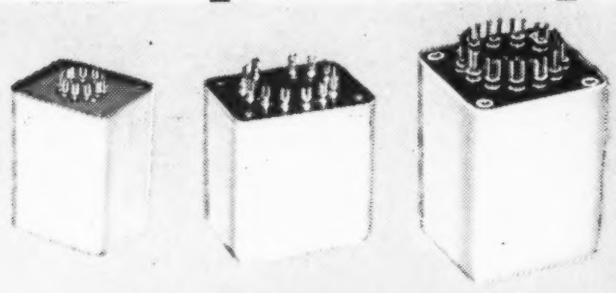
SUB and SUB-SUB OUNCER TRANSFORMERS
Audio Miniatures



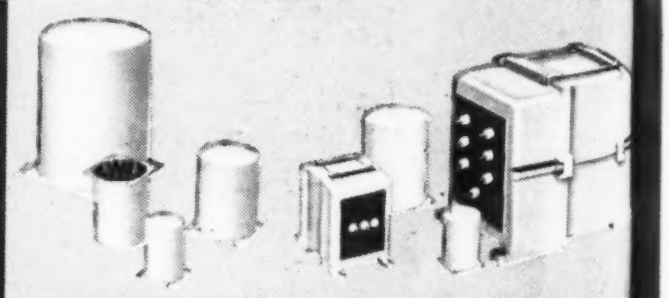
OUNCER and PLUG-IN UNITS



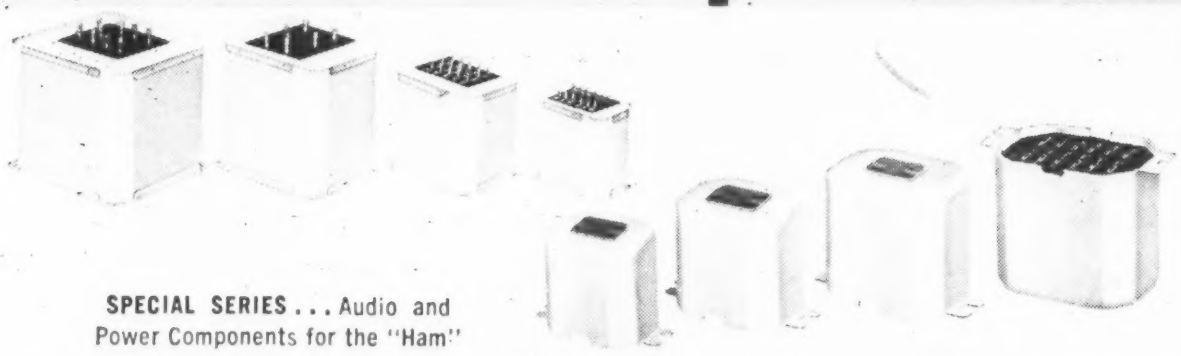
LINEAR STANDARD SERIES
Tops in Fidelity



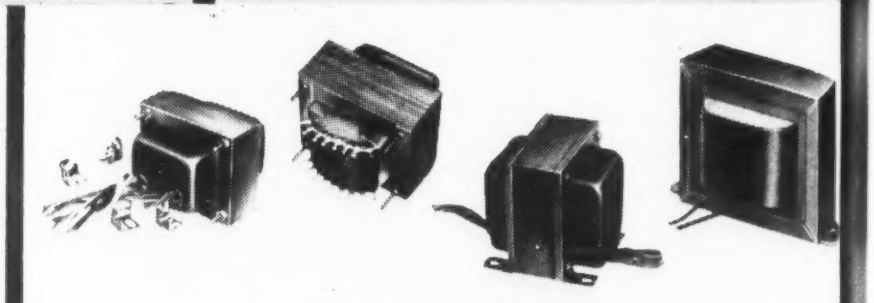
HIPERMALLOY and ULTRA COMPACT
High Fidelity Favorites



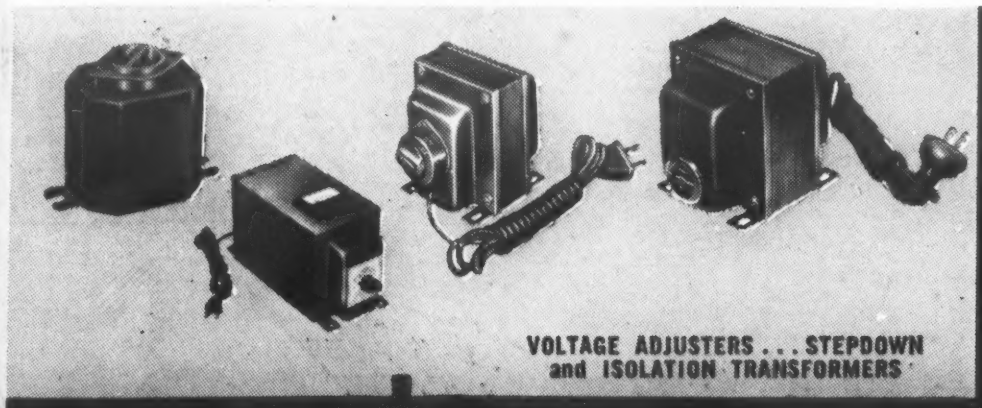
COMMERCIAL GRADE AUDIO and POWER COMPONENTS
for Industrial Use



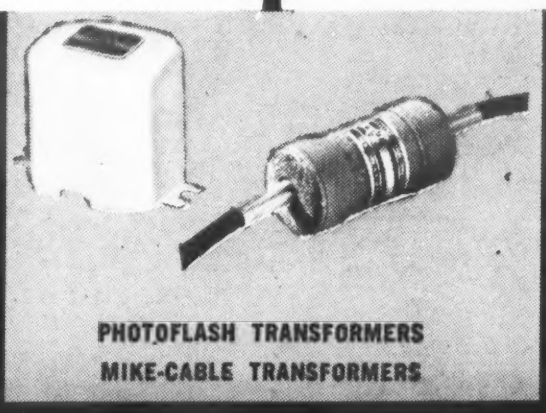
SPECIAL SERIES . . . Audio and
Power Components for the "Ham"



REPLACEMENT TYPES



VOLTAGE ADJUSTERS . . . STEPDOWN and ISOLATION TRANSFORMERS



PHOTOFLASH TRANSFORMERS
MIKE-CABLE TRANSFORMERS

EQUALIZERS

"I miss you"

"Good to hear your voice"

"Welcome Home"

"Happy Birthday"

"See you this evening".

These simple, friendly words are said many, many times over the telephone each day.

It is just such simple, friendly words from one person to another that make the telephone such an important part of our lives.

Surely it is indispensable in emergencies. But its greater value may be in carrying friendship and love and happiness across the miles.

For without the telephone, time and space would rush between us. And many of us would be so much alone.

BELL TELEPHONE SYSTEM

All over the world, technical "Minute Men" of the RCA Service Company assist the U. S. Army, Navy, Air Force.

How RCA "Minute Men" give added strength to our Armed Forces everywhere

At an Army camp in Northern Japan, RCA engineers check an outlying radar post. At an Air Force base in Florida, RCA specialists track a guided missile in flight. And at a Naval communication center in Guam, RCA technicians hurry to install a transmitter. All over the world, the technical "Minute Men" of the RCA Government Service Department are assisting our Armed Forces.

These "Minute Men"—experts in electronic installation, maintenance, and training—are backed by the RCA organization that provides the most complete electronic services and systems to the nation. Behind them stand RCA's 37 years of experience in communications and electronics; more than 70,000 RCA employees in manufacturing plants stretching from coast to coast; plus the fullest research facilities devoted to electronics that industry has ever known.

In all these ways, the RCA Government Service Department has proved its ability to give added strength to our Armed Forces in every part of the world.

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ELECTRONICS FOR LIVING

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BPA

SIGNAL

Communications-Electronics-Photography
Journal of the Armed Forces Communications and Electronics Association

VOLUME 10 MARCH-APRIL 1956 NUMBER 4

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AFCEA 1956 Convention Town
This aerial view of mid-town Boston was taken by Fairchild Aerial Survey, Inc. In the very center of the photo can be seen the Massachusetts State Capitol, facing Boston Commons.

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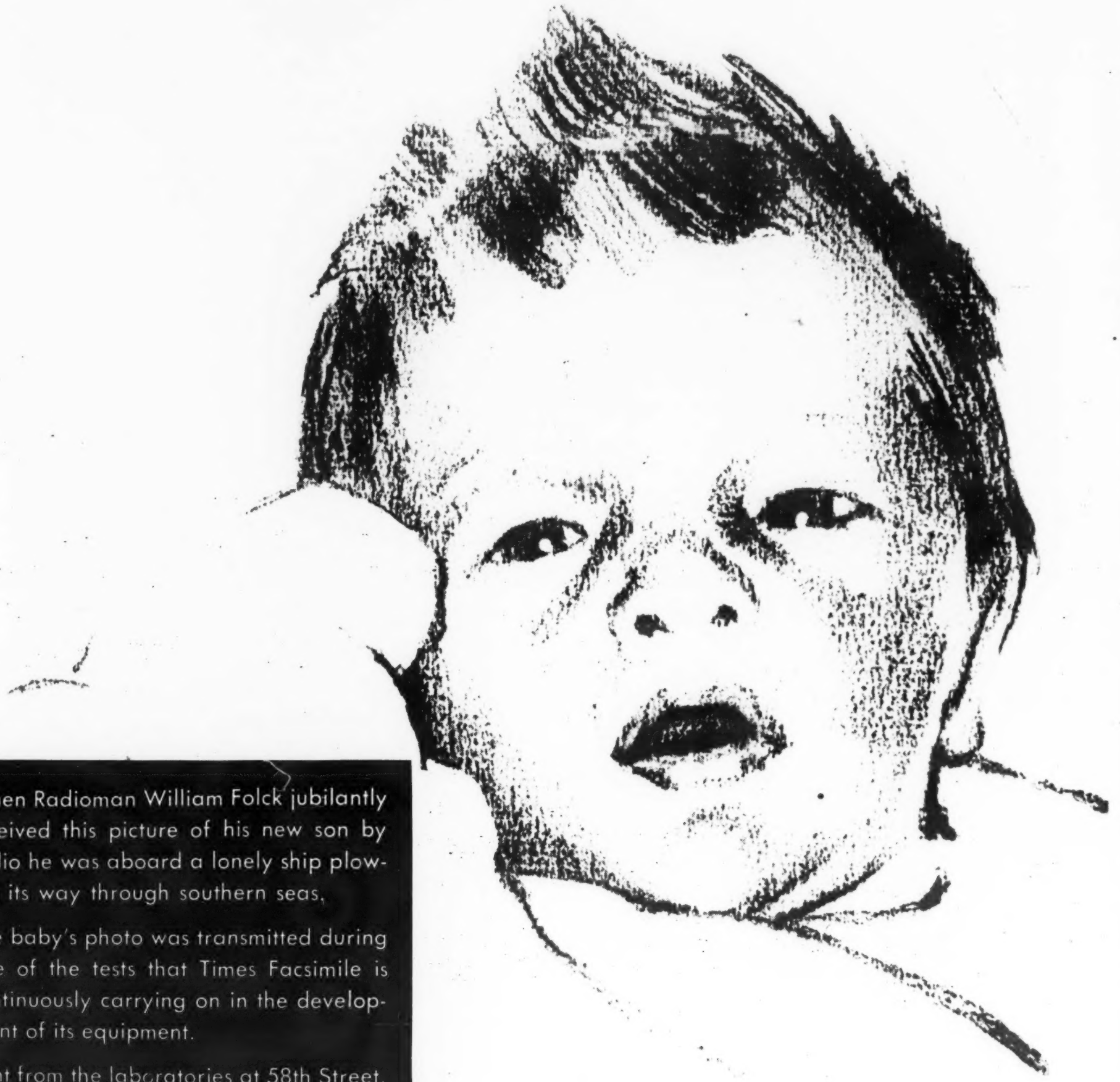
Authors are entirely responsible for opinions expressed in articles appearing in AFCEA publications, and these opinions are not to be construed as official or reflecting the views of the Armed Forces Communications and Electronics Association.

by FACSIMILE

picture of BILL FOLCK delivered to his father on Antarctic expedition...



When Radioman William Folck jubilantly received this picture of his new son by radio he was aboard a lonely ship plowing its way through southern seas.

The baby's photo was transmitted during one of the tests that Times Facsimile is continuously carrying on in the development of its equipment.

Sent from the laboratories at 58th Street, New York, it was received by the S. S. Atka part way around the globe. Far or near, when a special problem in communications crops up — think of FACSIMILE.

TIMES FACSIMILE CORPORATION

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What's CDT* got to do with SAGE air defense system

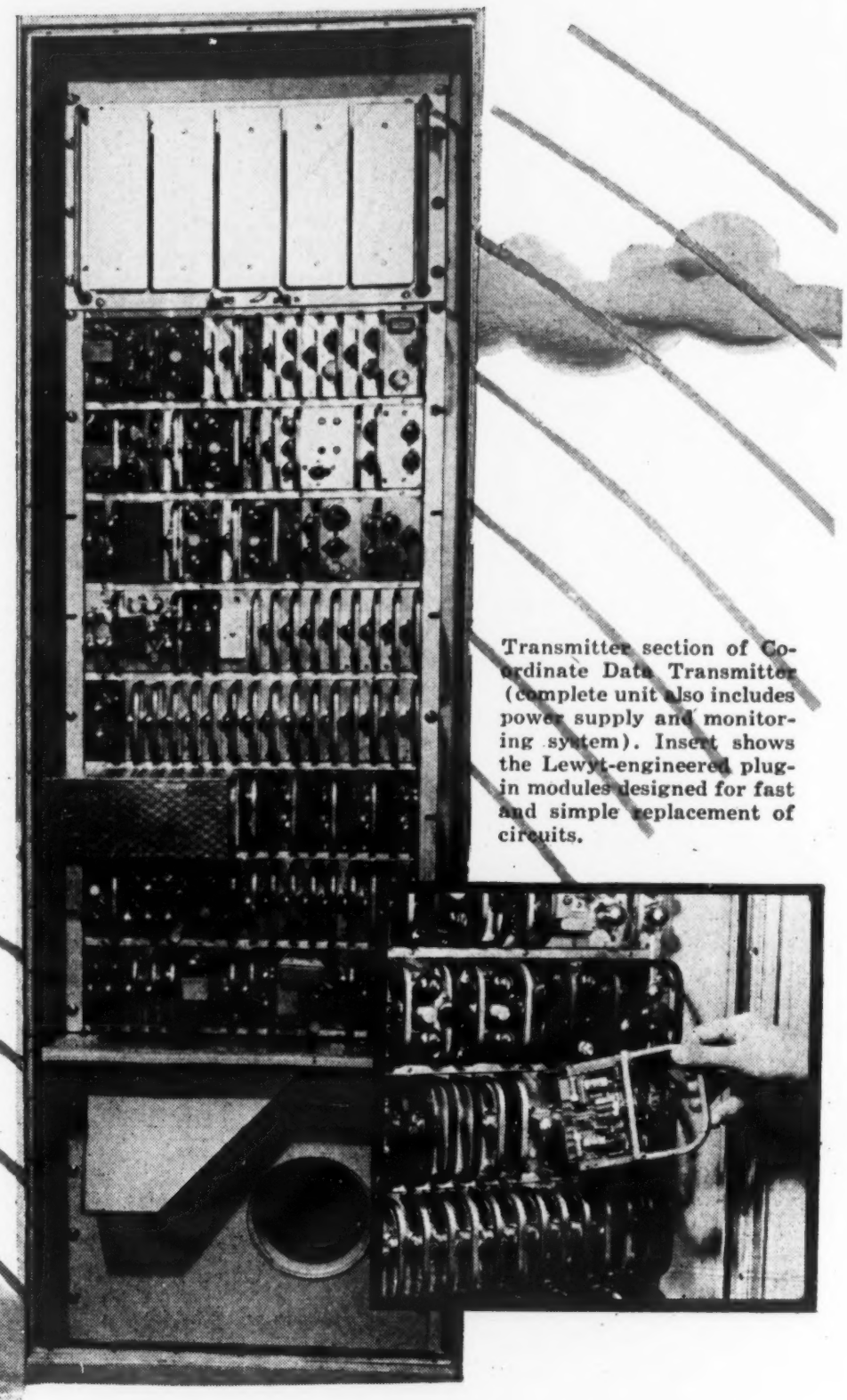
Guarding America against 'sneak' attack...remote unattended radar stations maintain a constant vigil. Here, Lewyt equipment, 'more than human', with split-second judgment performs a vital function. CDT* interprets the radar data and automatically converts the information into signal form for transmission over telephone lines to a control center.

Lewyt engineered and built into this data handling equipment the monitoring and sensing features that will provide continuous unfailing operation. Such reliability will contribute materially to the effectiveness of our overall air defense system.

This is another example of how Lewyt technological skills are keeping abreast of the most recent developments in electronics.

A brochure of other case histories is available by writing:
LEWYT MANUFACTURING CORPORATION,
Department S-3, Brooklyn 11, N. Y.

**Coordinate Data Transmitter*



Transmitter section of Coordinate Data Transmitter (complete unit also includes power supply and monitoring system). Insert shows the Lewyt-engineered plug-in modules designed for fast and simple replacement of circuits.

LEWYT

Development and Production of Electronic Equipment.

One of a series of institutional messages

We have been asked — time after time, by all levels of management:

How do CREI Home Study Graduates Compare with its Residence School Graduates?

E. H. Rietzke, President

FOR 24 YEARS, Capitol Radio Engineering Institute's residence school has provided industry with a limited number of well-trained men. Such blue-ribbon companies as Bell Telephone Laboratories and Sandia Corporation, Convair and IBM and many others, regularly send recruiters to CREI to interview graduates.

However, another aspect of CREI—the Home Study program—is a rich source of technical personnel who are just as valuable to industry. Here are the facts. We'll tell you our conclusion. You make the decision.

	RESIDENCE SCHOOL	HOME STUDY
Average age of graduates	25 years	26–30 years
Pre-CREI Background	High School, or real equivalent, some with little or no electronics background, but many with years of electronics experience in military or industry.	Professional Electronic experience with at least the equivalent of high school background. 98% are already employed in electronics work at the time they enroll. They range from young technicians to highly experienced engineers, who enroll because they are desirous of upgrading themselves.
Basic texts used	Same CREI for both.	Same CREI for both.
Lab facilities	CREI's modern, fully-equipped laboratory facilities.	Practical day-to-day work in the field takes the place of laboratory work. The subject matter of their studies is applied in their daily duties.
Length of course	3 collegiate years are condensed into 26 months average. Students attend classes 35 hours per week, 48 weeks per year. Virtually all time is devoted to practical engineering subjects, strictly liberal arts subjects being minimized.	Home study students proceed as governed by study habits, ambitions and available time. Average completion time for basic course for a diligent student:—Three to four years. Note: We feel there is something "special" and desirable about a man willing to devote spare hours and evenings to upgrading his technical knowledge and his value to industry. It takes a lot of fortitude to take on and complete a home study program as comprehensive as that offered by CREI.

CREI HOME STUDY STUDENTS at the time of enrollment are already working in industry in a job requiring previous training and experience, many in engineering or supporting engineering capacity—in production, design or testing—right along side of graduates of engineering colleges. Home study graduates are employed in practically every phase of the radio-electronics industry, in posts ranging from technicians to engineers. The list of the companies employing CREI home study students and graduates virtually constitutes the electronics industry.

Here is a partial list of leading companies that are officially using CREI technical training for members of their staffs: All America Cables & Radio; Canadair Ltd.; Canadian Broadcasting Corporation; Columbia Broadcasting System; Douglas Aircraft Company; Florida Power & Light Company; Glenn L. Martin Company; Pan American Airways (Atlantic Division); Radio Corporation of America; Trans-Canada Air Lines and United Air Lines. These companies have been using CREI courses for longer than eight years in some cases and some individual companies have enrolled hundereds of their men.

OUR CONCLUSION: For a young man without professional electronic background and hence no means of acquiring adequate practical experience with major electronic equipment we unhesitatingly recommend our residence course. This also applies in the case of the professional who feels the need of diversified laboratory work with a concentrated study schedule in the minimum amount of time.

To the engineer or technician working daily with modern equipment who is thus able to apply his advanced studies to his practical work, it is our considered opinion, based on 28 years of experience, that the home study program if diligently pursued will do an equivalent good job plus definitely stamping the individual as a "man of determination". We can highly recommend either graduate to you.

YOU'VE READ THE FACTS—WANT TO KNOW MORE? For detailed information about any phase of CREI's Home Study or Residence program, and how it can help your technical manpower problems, or your technical training program, please write directly to me:

MR. E. H. RIETZKE, PRESIDENT

CAPITOL RADIO ENGINEERING INSTITUTE

Accredited Technical Institute Curricula

Dept. 213-C, 3224 Sixteenth St., N.W.
Washington 10, D. C.

Electron optics

In *Charactron®*, as shown above, the principles of a cathode ray tube have been refined with pinpoint accuracy and applied to the presentation of aircraft surveillance data in "SAGE" . . . the Continental Defense System.

The precision required in manufacture is of the highest order.

Heart of the tube is a circular matrix on the face of which, in a ¼" square, 64 minute code characters have been punched. The electronic beam, responding only to processed radar data, selects these characters individually, at speeds up to 10,000 a second—and displays them in groups, identifying targets by type, speed, altitude and track number.

This new tool, the *Charactron®* electron optic tube, has many applications besides that of air surveillance. We'd welcome the opportunity to consider any problem of *yours* which this latest development of precision work in electron optics might well help to solve.

STROMBERG-CARLSON COMPANY

A DIVISION OF GENERAL DYNAMICS CORPORATION

General Offices at ROCHESTER 3, N. Y.

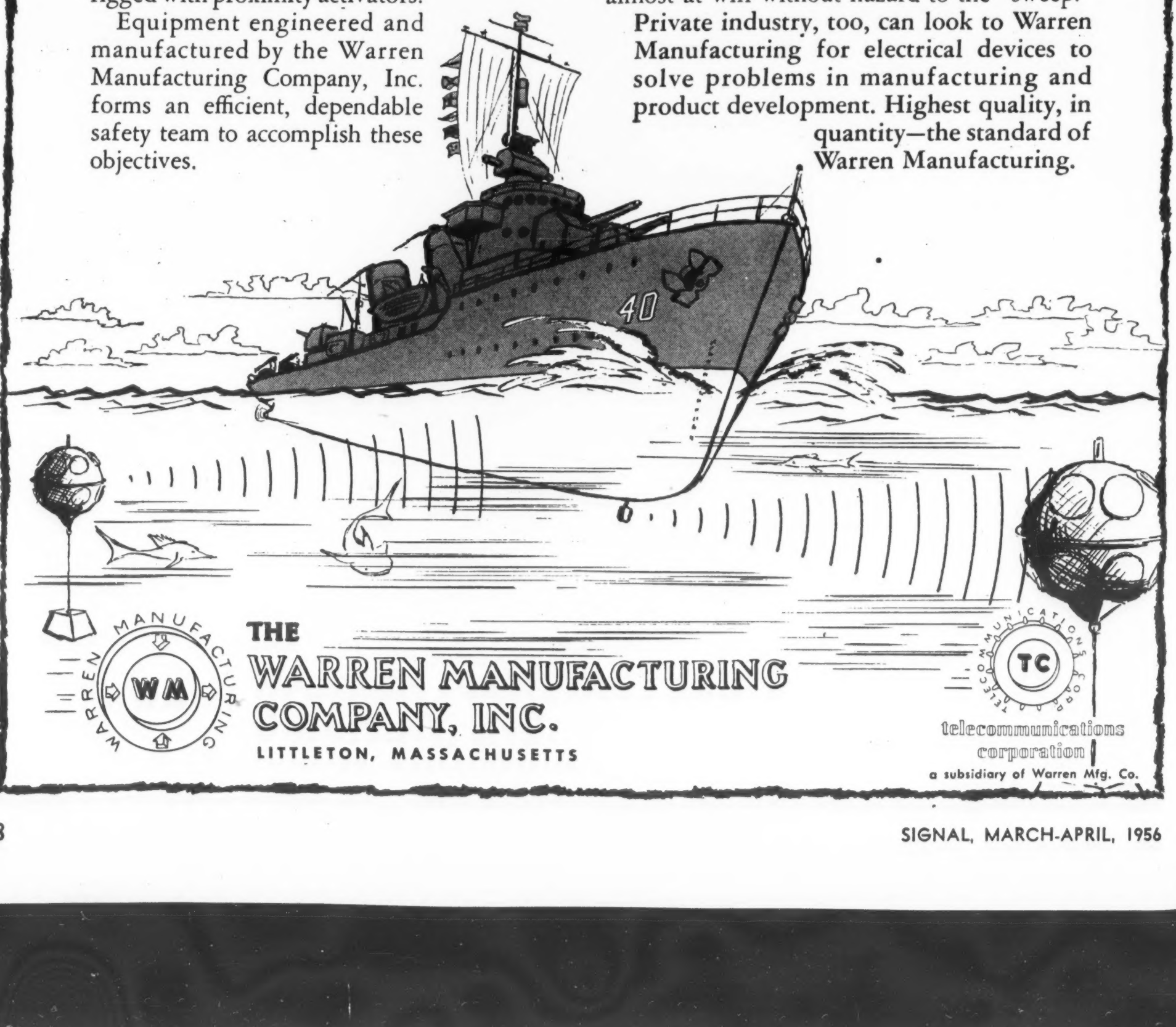
. . . the dangerous problem in minesweeping operations!

Laws of the hunt are basically the same as the laws of warfare. It is not enough to detect and destroy enemy mines. The minesweeper must prevent its own destruction by mines rigged with proximity activators.

Equipment engineered and manufactured by the Warren Manufacturing Company, Inc. forms an efficient, dependable safety team to accomplish these objectives.

Non-magnetic stainless steel construction renders mine detonation devices useless. The Warren Manufacturing Company's low magnetic signature control equipment permits destruction almost at will without hazard to the "sweep."

Private industry, too, can look to Warren Manufacturing for electrical devices to solve problems in manufacturing and product development. Highest quality, in quantity—the standard of Warren Manufacturing.



THE
WARREN MANUFACTURING COMPANY, INC.
LITTLETON, MASSACHUSETTS

telecommunications corporation
a subsidiary of Warren Mfg. Co.

A LETTER FROM STATION CFAC,
CALGARY, ALBERTA

E. C. CONNOR
Technical Director
Broadcast Station CFAC
Calgary, Alberta

AN AMPEX FALLS —AND PROVES ITSELF!

An accidental fall really proved the ruggedness of one of our Ampex 600's. It had had to be located on a narrow shelf four feet above a cement floor in an industrial building. Despite precautions someone pulled on the microphone cable at precisely the wrong moment and the recorder landed on one corner on the floor. The Ampex continued to record, and to the surprise of all concerned, it was impossible to detect the spot on the tape where the machine had fallen off the shelf. The only damage to the recorder was a displaced hold-back tension spring.

At present we have in service two Ampex 401's, two 403's, two 350's and two 600's. Required servicing has been much less than anticipated, and all are within specifications. To say that we are enthusiastic about the performance of our Ampex recorders could be considered an understatement.

Sincerely,

BROADCAST STATION CFAC

Earle C. Connor.

E. C. Connor
Technical Director

THE AMPEX 600 WAS DESIGNED BOTH FOR USE AND ABUSE

When the 600 was first developed, Ampex engineers performed a test similar to CFAC's accidental drop—not by accident, but quite intentionally. Also, the Ampex 600 was given running tests equivalent to an estimated 10 years of service. These are reasons why the price you pay for an Ampex buys both the finest performance available and the most hours of service per dollar.

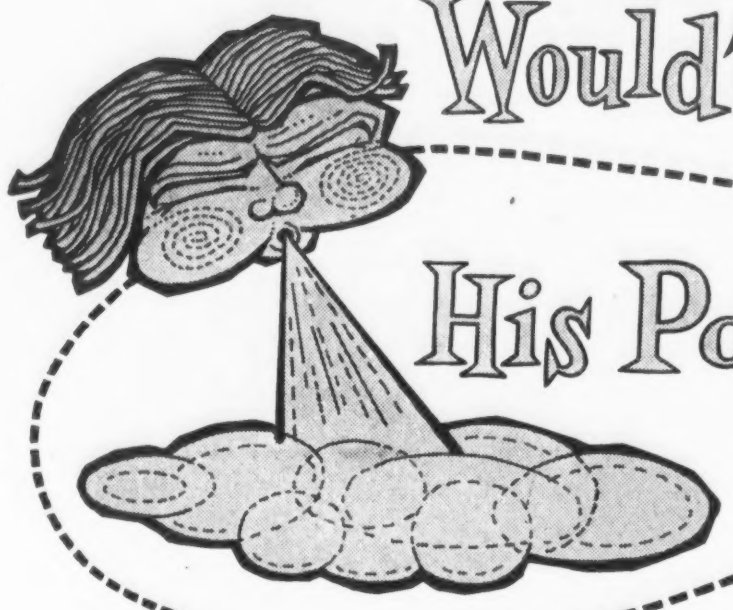
AMPEX

For descriptive literature, write Dept. P-2304

SIGNATURE OF PERFECTION IN SOUND

934 Charter Street • Redwood City, California

Magellan Would'a Fractured His Poopdeck



. . . matching TOWER'S Log!

FERDINANDO MAGELLAN was quite a fiddle-foot in his day, but he was an amateur compared with TOWER construction crews. History records that old Ferd and his men traveled approximately 27,000 miles on their global circumnavigation. TOWER crews have virtually traced and retraced this journey 27 times, while erecting more than 2,000 tower installations around the world. TOWER installations are serving in corners of the globe Magellan never dreamed existed . . . like Reykjavik, Thule, and Okinawa. So, no matter what or where your tower problems are, TOWER will solve them for you . . . on time and according to your exact specifications.

Write for free illustrated booklet

TOWER CONSTRUCTION CO.

tower fabricators and erectors the world over

Sioux City, Iowa

3 NEW

AMPLIFIER KLYSTRONS FOR MICROWAVE SYSTEMS

Currently in production are three new Cascade Amplifier Klystrons for a wide variety of applications in microwave systems. These tubes incorporate advanced engineering techniques which Sperry has pioneered since the Company first developed the Klystron in 1938. Two of these tubes feature the new Sperry technique of space-charge focusing which eliminates cumbersome and expensive magnetic structures. All three tubes are currently available.

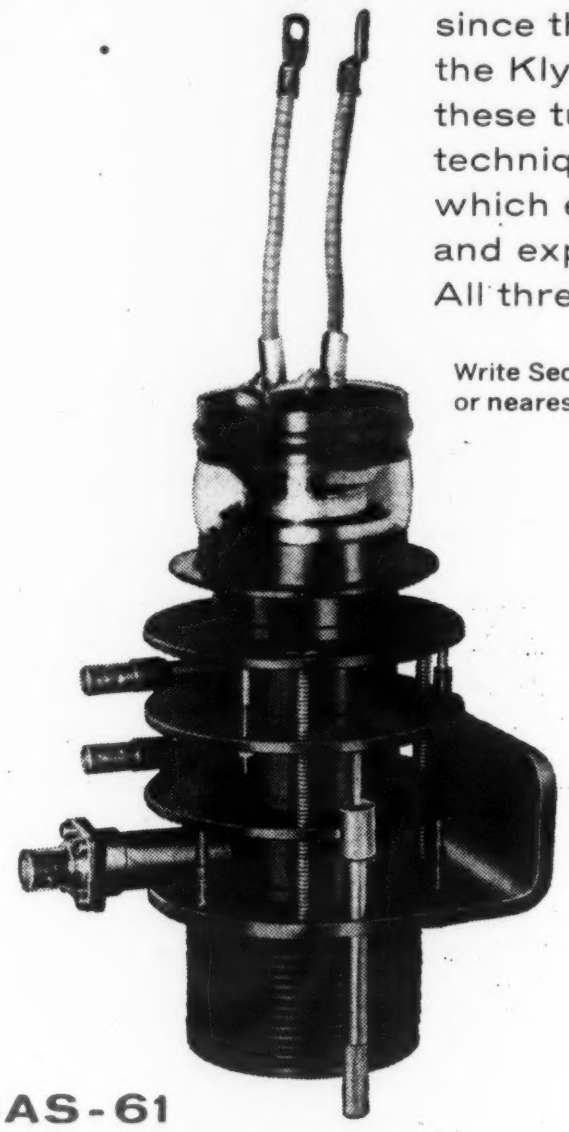
Write Section K-1, Electronic Tube Sales Department or nearest district office for further information.

SAL-81

A 20 kw pulse transmitting tube featuring space-charge focusing. This tube is used in low power radars, for airborne as well as ground equipment. It can also be used as a driver for higher power Klystrons, in navigational aids, distance measuring equipment, beacons and pulsed communications systems.

This tube has extremely long life. It has integral resonant cavities and tuners and is thermally compensated for changes in ambient temperature and duty cycle.

Frequency Range	1215 to 1365 mc
Power Output	9 to 21 kw
Power Gain	23 db

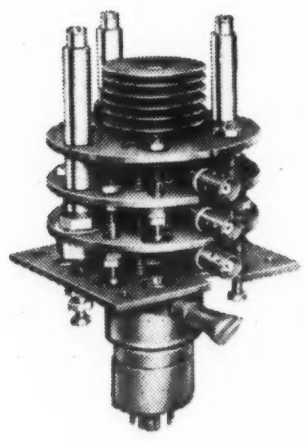


SAS-61

A 10 kw pulse transmitting tube with space-charge focusing which eliminates magnetic structures. This medium power amplifier is used for low power radar systems. Can be used as a driver for higher power Klystrons in radar and linear accelerator systems.

This tube has extremely long life. Integral tunable cavities, with one tuning screw for each cavity, permit rapid tuning over a ±30-mc range with additional adjustments to cover entire frequency range.

Frequency Range	2700 to 2900 mc
Heating Time	90 sec.
Peak Power Output	0.5 to 15 kw
Maximum Drive Power	30 w
Power Gain	20 to 30 db



SAS-60A

Cascade Amplifier Klystron especially for use in cw doppler radars. Can be used as a driver for higher power Klystrons, in laboratory test equipment, as frequency standard, and in beacons and MTI radar.

This new, improved tube supersedes the 2K35 Klystron . . . with higher gain, lower beam voltage, wider band width, easier tuning and smaller power supply. Can also be used as high-level mixer.

Power Gain	30 db
R-f Output Power	2 to 25 w
R-f Input Power	1 to 100 mw
Frequency Range	2700 to 3330 mc

Visit Sperry at 351-353 Microwave Avenue, Radio Engineering Show.

SPERRY GYROSCOPE COMPANY

Great Neck, New York

DIVISION OF SPERRY RAND CORPORATION

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Guest Editorial

by

Senator Warren G. Magnuson
Chairman
Senate Interstate and
Foreign Commerce Committee

Progress and Problems

Senator Magnuson (D-Wash) also Chairman, Subcommittee on Merchant Marine & Fisheries

One of the chief characteristics distinguishing this century from its predecessors has been the phenomenal advance in the field of communications. Communications has become a major American business enterprise. It is one of the largest service industries in the nation with more employees than the population of some of the states, gross assets running into billions, and an annual income exceeded only by few groups.

Trade and commerce are dependent upon it to a great degree for constant, quick, interchange of words and intelligence. It is the vital nerve system of our modern military establishment. It serves ably in promoting international understanding and good will. It is, therefore, of paramount public interest to take all possible steps to increase the efficiency and adequacy of these services.

Developments in this all-important field since the close of World War II have been great but have brought with them an increasing number of problems which sharply point up the need for an overhaul of our Government facilities charged with handling communications affairs. The allocation of scarce radio frequencies, the backbone of the communications industry, has always been a challenging problem and the demand for a greater share of the spectrum by both non-Governmental and Governmental groups merely aggravate the problem.

Under our present structure, the responsibility for frequency assignments is divided. There is no one entity that has the direct responsibility over this function. This has led and will continue to lead to serious snarls, misunderstandings and possible waste. Because of its limited scope, the spectrum must be allocated efficiently and yet be flexible enough to meet changing and emergency conditions. The use of these resources must have the most careful planning and administration, for billions of dollars are invested by the Government and private industry.

Frequency allocations cannot be changed "willy-nilly" without serious effects. Mistakes have a way of reaching far into the future. Also, a clear, affirmative policy must be established as a guide in negotiations with foreign countries. A sound, well-defined policy is absolutely necessary in order to increase the effectiveness of the United States in international relations on communications matters. Strong leadership, efficient administration, and positive direction are essential if the United States is to meet the growing needs and challenging problems of the communications industry.

The inadequacy, confusion and deficiencies in our communications policy were graphically demonstrated by the findings and conclusions of the President's Communications Policy Board, created by President Harry S. Truman, in its Report issued in February, 1951, which recommended in part:

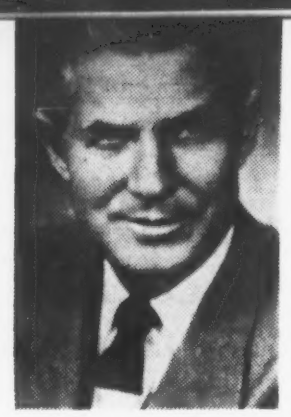
> "Fundamental changes in telecommunications require the overhaul of Government machinery for formulating telecommunications policy and for administering certain telecommunication activities in the national interest."

Some steps to meet the recommendations of the Communications Policy Board have been taken.

However, I feel that the magnitude of the communications field and its relationship to our national well being is such that it requires a single entity to be charged with the firm responsibility of formulating and administering an overall well-defined policy. It is my belief that this central authority should be the Federal Communications Commission. This is the agency that has been created as the expert in the field of communications and is an arm of Congress. This agency should have the overall responsibility of formulating, coordinating and administering a total national communications policy. Whenever problems concerning security are involved appropriate proceedings can be adopted. But the essential fact is that one agency will be responsible for maintaining all records and assignments of frequencies as well as charged with the responsibility of speaking for the United States in its international negotiations concerning communications.

Members of the Committee

John O. Pastore
(D-R. I.)
Chairman
Subcommittee on
Communications



A. S. Mike Monroney
(D-Okla)
Chairman
Subcommittee on
Aviation

John W. Bricker
(R-Ohio)
Ranking Minority
Member

Andrew F. Schoeppel
(R-Kan)

John Marshall Butler
(R-Md)

The jurisdiction of the Senate Interstate and Foreign Commerce Committee includes all proposed legislation and other matters relating to the following subjects:

1. **Interstate and foreign commerce generally.**
2. **Regulation of interstate railroads, busses, trucks, and pipe lines.**
3. **Communication by telephone, telegraph, radio and television.**
4. **Civil aeronautics.**
5. **Merchant marine generally.**
6. **Registering and licensing of vessels and small boats.**
7. **Navigation and laws relating thereto, including pilotage.**
8. **Rules and international arrangements to precent collisions at sea.**
9. **Merchant marine officers and seamen.**
10. **Measures relating to the regulation of common carriers by water and to the inspection of merchant marine vessels, lights and signals, life-saving equipment, and fire protection on such vessels.**
11. **Coast and Geodetic Survey.**
12. **The Coast Guard, including life-saving service, lighthouses, lightships, and ocean derelicts.**
13. **The United States Coast Guard and Merchant Marine Academies.**
14. **Weather Bureau.**
15. **The Panama Canal and interoceanic canals generally, with some exceptions.**
16. **Inland waterways.**
17. **Fisheries and wildlife, including research, restoration, refuges, and conservation.**
18. **Bureau of Standards, including standardization of weights and measures and the metric system.**

George A. Smathers
(D-Fla)
Chairman
Subcommittee on
Surface Transportation

Charles E. Potter
(R-Mich)

Price Daniel
(D-Tex)

Frederick G. Payne
(R-Me)

William A. Purtell
(R-Conn)

James H. Duff
(R-Pa)

Strom Thurmond
(D-S. C.)

Alan Bible
(D-Nev)

Sam J. Ervin, Jr.
(D-N. C.)

Research and development activities in all the military services are concentrated heavily on the guided missile program. Working under a Navy contract, the simulator section of the Applied Physics Laboratory tests missile performance before the weapon is a reality.

GO THEY AWAY

Between breakfast and lunch, APL scientists venture into outer space up to 100 times, riding the guided missiles without taking their feet off the ground. They are powered by computers and slide-rules on these all-important, fact-finding trips without movement.

by Cyril J. O'Brien
Applied Physics Laboratory
Johns Hopkins University

IF WE EVER GET AROUND TO MAKing scheduled flights to the Moon or Mars, we still will not be too far ahead technically of what is being done today by the scientists of the Applied Physics Laboratory of The Johns Hopkins University in Silver Spring, Maryland.

Here, on the outskirts of the Nation's Capital, scientists are making up to 100 trips into outer space in a single morning, between breakfast and lunch. The sky-soaring junkets are not imaginative for they contain all the realism of a genuine flight including missile roll, gravity pull, and some of the missiles actually get out of control and run all over the sky. Yet the sky-riders never leave their laboratory.

Actually, it is all done with numbers and takes place in three or four big rooms, bordered with large black cabinets, oscillographs, dials, switches and recording needles that scribble irregular lines on moving graph paper.

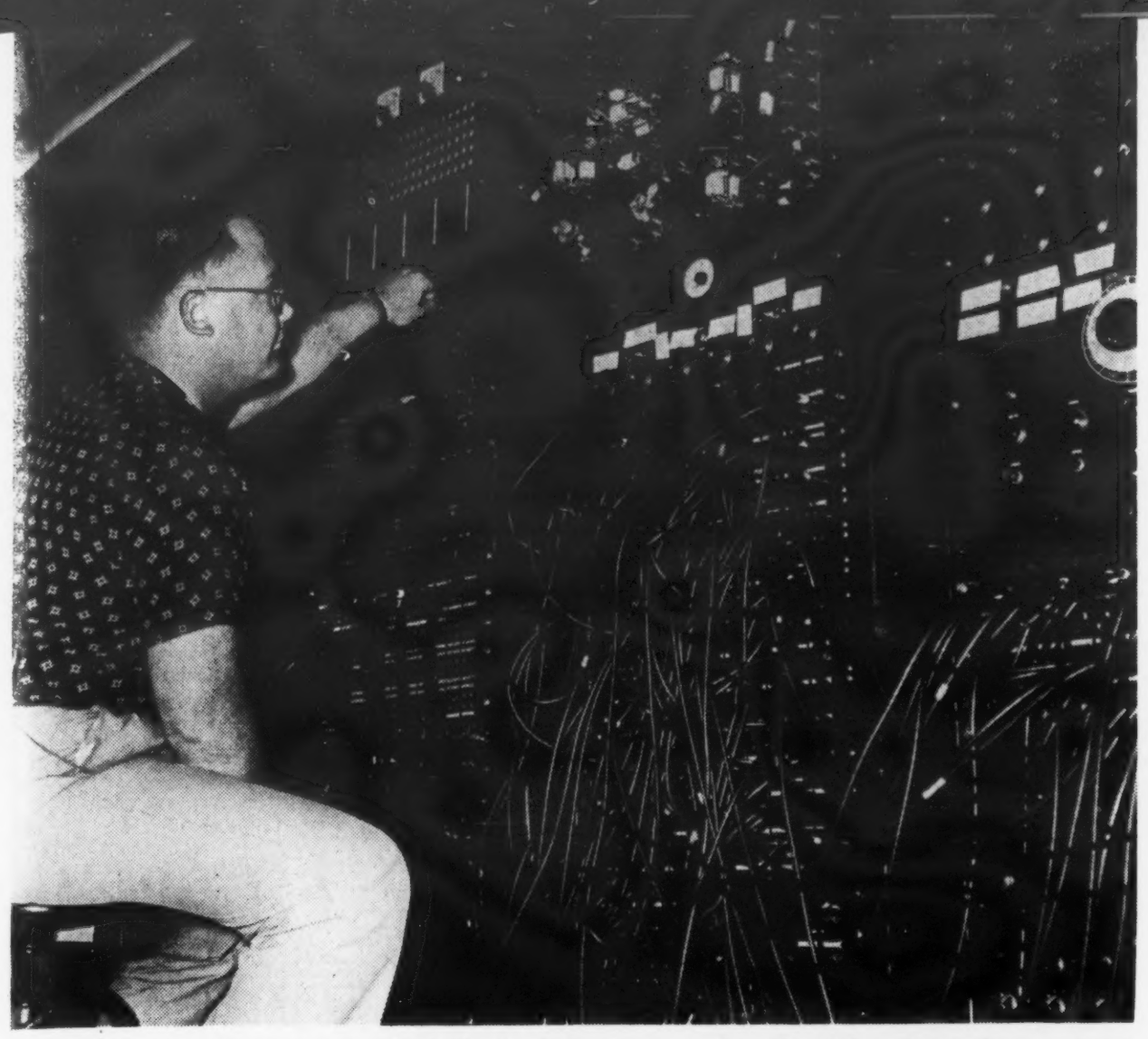
At first glance, it might seem to smack of something from a science pulp tale, but take it from the men and women of the simulator section of the Applied Physics Laboratory, it is all pretty much routine and has no more of the bizarre to it than a calculating machine.

They'll tell you that all they do is solve mathematical problems—and do it with pencil and paper, slide rules, office tabulating machines, rows of analog computers and more complicated digital machines. Their job is to make mathematically simulated missile flights to test theories, designs, controls, stabilization, and the hundred-and-one other "musts" that have to be cleared up before researchers actually send a live missile from a launcher.

New Weapons Are Well Known Before They are Made

Not many months ago, the Navy announced its newest supersonic guided missile, the deadly *Terrier*. Last November in Philadelphia, the Navy recommissioned the cruiser *USS Boston* as the world's first guided missile cruiser to carry the *Ter-*

With so much current attention focused on missile and rocket problems, we add our contribution of three articles pertaining to one special phase of the problem, testing. Each article is about the work of one of the military services — Navy, this page; Air Force, page 26, and Army, page 37.



A research scientist at the Applied Physics Laboratory pushes the "silver button" on a bank of REAC machines to send a simulated missile soaring on a test flight into space. The black "spaghetti" in the lower right gives some idea of the immense amount of wiring and preparation that goes into a test flight.

rier. Today, the missile is a part of the armament of a modern Navy for modern warfare. But to the scientists at the Applied Physics Laboratory who developed the *Terrier*, the amazing needled-nosed antiaircraft weapon is no longer in the realm of the "very new." From their laboratory flight station they sent it aloft on many of these mathematical flights. Here, they found the "bugs" in its complicated mechanism, watched it putter out in test flights, and finally they saw it fill all the expectations of the designers. These test flights were all made even before the *Terrier* zoomed aloft in a live flight test

When the Laboratory wants to know the effectiveness of a new design or control system, it could well approach the problem by simply firing a test missile and studying the actual flight. But there may be 300 similar questions in a day and no laboratory could afford to launch 300 missiles in that time. Also, often the questions are asked before the prototype of the missile is made. Here's where the scientists in the simulator section come in.

Take Off in a REAC

To see how such problems are solved, let's take a "simulated" ride with these futuristic sky-pilots on a bank of REAC (Reeves Analog Computer) machines. You walk into the research "flight deck" to see the big instruments stacked side by side and connected by myriad wires. To the uninitiated, these look like giant radio receiving sets with an overabundance of dials. Before a member of the flight team can turn a knob, however, he must wire his problems into the machines.

Now, electrical circuits take the place of numbers and equations. It is sometimes days until the elaborate wiring is completed and often it takes equally as long to recheck for operational accuracy. Then, when the equations have been mechanized, the "flight" begins.

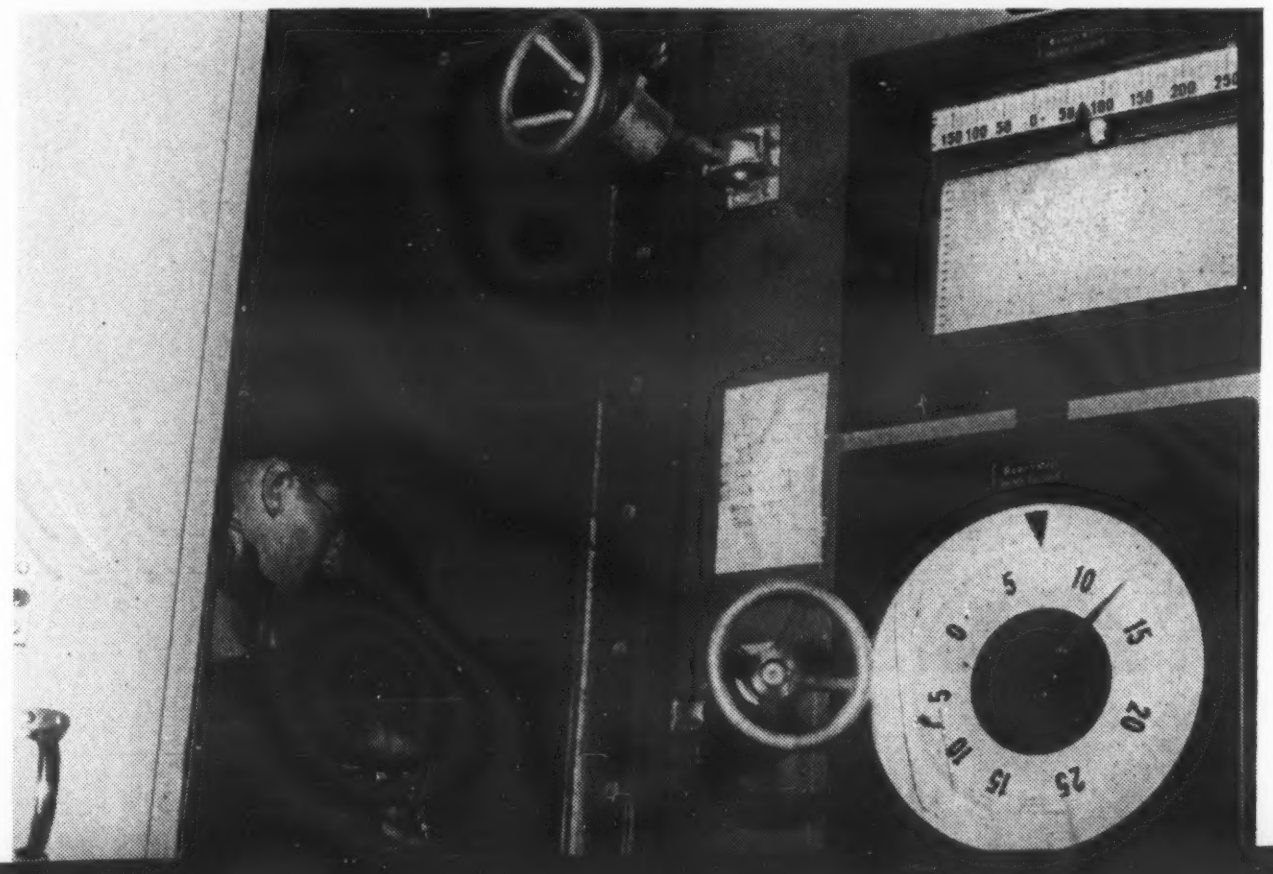
Your pilot sits on a low stool in front of his control panel. He pushes a silver button. Your ride is disappointingly short. For a scant thirty seconds the computers flutter, a few red lights go on, others flash, and a needle on a brush recorder scribbles a few lines on a moving roll of paper. The flight on the machines may represent ten times the speed of an actual flight or a tenth of it. Operational time on the machines is usually kept to about 30 seconds for convenience and analysis. But in that brief spurt of the simulated missile, just about everything is here that a pilot would find on an actual flight: rapid ascent, backlash of mechanical components, pull of earth, etc. Your missile might go wacky and ride off uncontrolled into space, but you took it at your own risk, and you have had your ride. Actually, such misbehavior is often prompted by operators who want to find the reaction of a simulated missile to certain conditions. When the equations (or conditions they represent) do not work, the Applied Physics Laboratory researchers still are able to record important information. Referring to this data, designers some time later will know what is taboo when they sit down to plan a real-life model.

There are times when the tests are more realistic. Occasionally, rolled in on a few big dollies will be an actual missile model and researchers will hook up the real thing to the computers for a test "from life." The flight is very much the same.

Time Saver in Operation

Dr. James W. Follin, who heads this research group, observed that many of these problems can actually

This three-foot cube temperature, humidity and altitude chamber makes blinding snowstorms, creates the humidity and heat of the Belgian Congo, or cold that would make an Eskimo run for cover. It is part of the APL environmental test laboratory where components of guided missiles are exposed to every type of weather punishment that could be found on the earth.



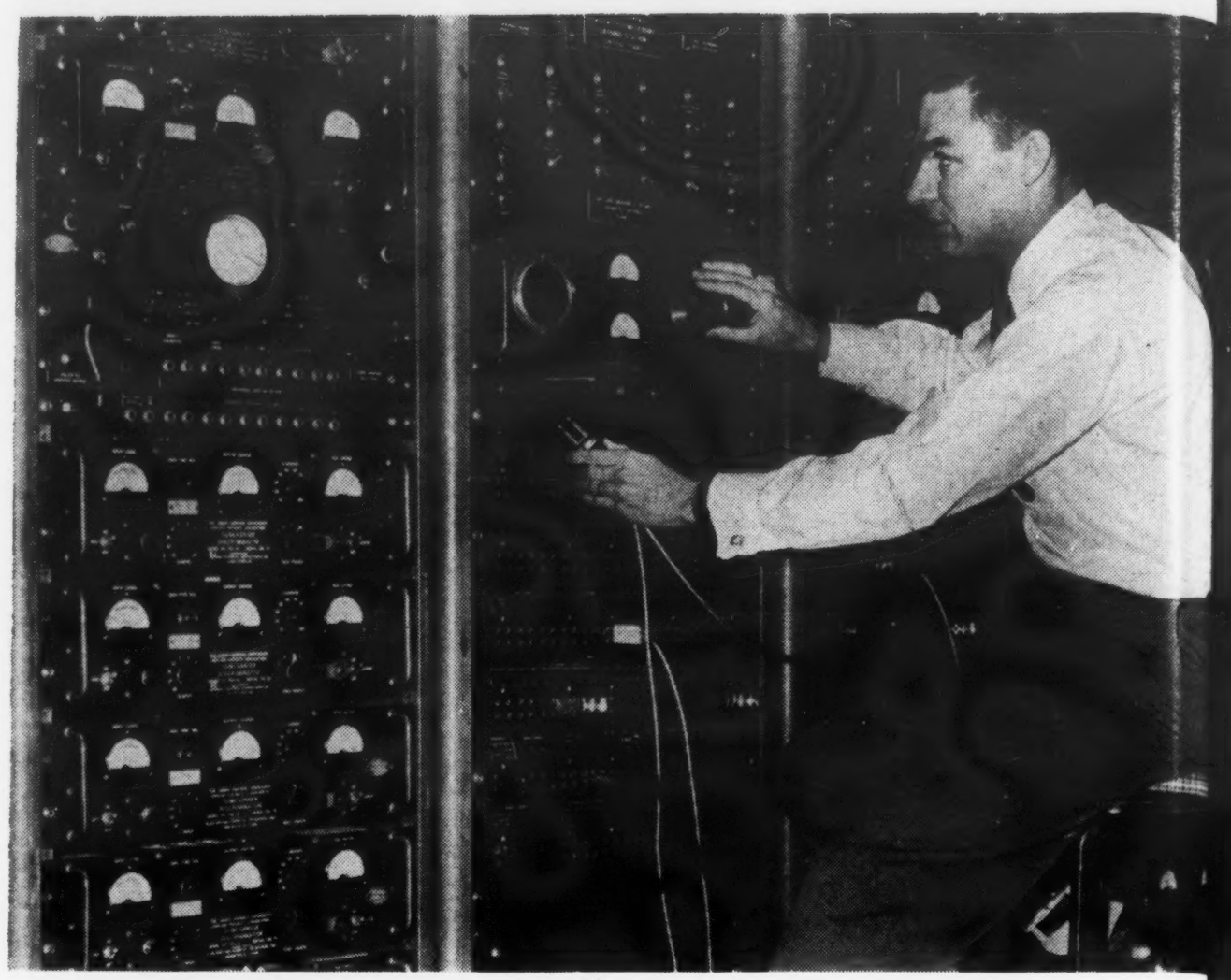
be mastered with pencil and paper. However, most of the burden is thrown on the machines, and no wonder. These high speed computing machines are ahead of man 100 to 1 or 1,000 to 1. In many cases, the computers can do in a minute work which might keep a man occupied for weeks.

One problem will most certainly have to stay with the computers, for few men would be fool enough to try it in reality, even for science. This is the problem of the half-riders, or the launching researchers. They study take-off and make simulated rides from the launcher to a few thousand feet in the air—then, theoretically, jump out. The jumping out is not part of the test, it is simply that their test is completed after the launching run.

Special Design for Machines

Because of the unusual nature of these tests, staff members are unable to use the conventional, commercial computing machines as they come from the manufacturer. Even the most specialized machines must be adapted by the Laboratory staff to the complicated work of the simulated flights tests. The REAC machines, for instance, were so adapted that fully fifty percent of the equipment now used was constructed at APL. The work is done by a team of innovators and trouble-shooters also responsible for taking "bugs" out of the big laboring computers, and usually in a hurry, for machine time is valuable, and in a guided missile research and development laboratory as APL, the demand is high.

How accurate are these tests? Dr. Follin points out that information obtained in the Laboratory tests is usually identical with that shown by telemetering records of actual flights. It means that scientists are pretty sure of what is going to happen, even before a "live" flight is made.



A staff member at APL sits before a bank of electronic panels which make up part of a telemetering ground station. These discriminators and oscillators unscramble data radioed by telemetering instruments in a missile to recorders on the ground during actual live flight. Raw data is then fed to these machines which turn out readable material which is used in improvement of the missile or for later design or research work.

A bank of REAC computers used in simulated flight tests.

Future Just as Busy

Right now, the research orders on missile components and other equipment that move across Dr. Follin's desk are enough to keep our fleet of simulated missiles in constant flight. With development and adaptation of new and more amazing electronic computers, these shirtsleeve pilots will continue to plan trips that will make Columbus look like a piker.

For results they can point to the *Terrier* or the *Aerobee*, the Navy high-sounding rocket. The latter, developed nuder the etechnical direction of the Applied Physics Laboratory, has been used extensively in upper altitude research especially in the field of cosmic rays. It will be a major tool of scientists in the International Geophysical Year, 1957-58.

So, some day when a younger sister of the *Terrier* or *Aerobee* goes roaring off over a flight station, past moving picture and press cameras, it will be no wonder if such space veterans as the lads and ladies of the simulator section at APL look up quite casually and say: "I've seen it go aloft a thousand times."

Quotes in Review

a survey of major statements made during the past two months

"Too frequently you the policy-makers in your business, you the managers of your firms are too busy with the day's tasks in your own little office, in your problems of communications and electronics that you fail to keep your eyes focused on the fact that the management of your business demands a professional attitude.

"We don't take enough time to sit down and thrash out the notions behind the term "profession." We don't seem to realize that they must be in the head and in the heart and not on the lips or in the book. These ideas require time to develop and to digest. They demand work in order to be clearly understood and they demand some deep, serious thinking on the part of every one of you.

* * *

"A first class, a top-flight man in your position has three qualities:

1. Knowledge of his business, or "intellectual competence."
2. Know-how—knows the inventions, knows what's new, what's best and knows how to apply what's new and what's best for him—or we can call it "technical skill."
3. A sense of responsibility, a sense of duty, a sense of service—not only to his company, to the people he hires and manages, but also to the association and the industry of which he is a part. We call it "social consciousness."

* * *

The grass roots in the soil of responsible management, the tap-root that must go down deep in the earth of management is a sense of justice, of loyalty, of honesty . . .

1. to the company
2. to the people you serve, as well as
3. to the association

This sense must be in the heart and not worn on a pin that you stick in the lapel of your coat.

* * *

"This sense of contribution, this notion of obligation, is a matter of justice and not charity. For, according to your positions in the company you manage or own, according to the influence you wield in the communications and electronics industry in California, is the degree of obligation that you have to make this industry healthy and sound, to make your company a peaceful and human place to work. This sense, or the tap-root of responsibility must go down deep into the hearts and minds of any one of you who ambitions to be professional. It would be wonderful indeed, if you could develop this sense of responsibility by having someone preach it to you or by just telling you to read a pamphlet. But, sad to say, responsibility is a virtue and a virtue is a habit that you acquire by repeated acts. You can't develop this sense of being a professional management man by articles you write in magazines, or speeches at convention time, or formulas or constitutions that you may have in your association, but only through the actual living, through actual practicing of the obligation of contribution which your position in the industry places upon you."

The Rev. Wm. J. McIntosh, S.J.
Director, Industrial Relations Center
Loyola University, Los Angeles
AFCEA Southern California Chapter

"To describe communications and the Army as deterrents to war, I have in mind much more than the use of communication in a strictly military sense. It is axiomatic that, to preserve peace, a nation must have adequate military forces. It is even more fundamental that the country have a strong religious, moral, social, political and economic foundation.

* * *

"When new and powerful weapons were developed, many people hoped that the tough business of land fighting might be eliminated. However, when the possibilities of these new weapons were weighed by the responsible military and civilian leaders, it became clear that we could not safely rely on any one weapons systems or any single service. The wisdom of this judgment is becoming more and more apparent as the Communists acquire an arsenal of atomic weapons comparable to our own. Responsible thinking has been, and still is, that there is no cheap way to prevent wars—no painless way to win them, and no super weapon which will ultimately *guarantee* victory.

"In the uncertain world of tomorrow, the United States faces the need for more adequate military preparedness than ever before. The strategy and force of the United States must be sufficiently flexible to meet all threats—atomic, non-atomic; local war, or general war. Since it is impossible to foretell which of these might be forced upon us, it is evident that the country must have a versatile military structure capable of successfully dealing with all principal eventualities.

* * *

"With this background, let us now see if we can answer the question: "When there is no fighting going on, what do you soldiers do?"

"The answer lies in maintaining the instant combat readiness of a strong deterrent—a military force whose presence in 73 different countries throughout the world gives clear-cut indication of our intentions to discharge our commitments to our allies and to all free peoples of the world. Of equal importance is the urgent program for planning and developing greatly increased capabilities in our organization, our techniques and our weapons and equipment.

"This means an aggressive and enlightened research and development program designed to enable the ground soldier to meet and defeat numerically superior forces. These programs, carried on in close cooperation with industry and scientific institutions, seek to insure that the methods and materiel with which we fight a future war will bear little resemblance to those of the past."

Major General James D. O'Connell, USA
Chief Signal Officer
Poor Richard Club, Philadelphia, Pennsylvania

"The present air traffic situation, with its rapidly increasing volume of aircraft of widely divergent speed ranges from helicopter to jet, with the wide range of pilot skills from novice pilot to the highly experienced, with the minimum equipped aircraft and fully equipped aircraft—all operating in the same airspace, gives indication that special attention must be given to the need for changes in fundamental philosophy.

'It would appear that the time has come for modifying this system to provide greater capacity and increased protection for all of us. The concept of which I am speaking would provide both military and civil operators with a system more compatible with their needs. Under this concept, a portion of the airspace (that which is generally now in use by conventional aircraft) would remain unchanged and would employ both VFR and IFR techniques on much the same basis as currently practiced. At *high altitudes* and in *certain critical high-density areas,* positive separation would be provided during all types of weather conditions. Controlled airspace should be expanded to include these areas. At altitude, control would be exercised on an *area* basis rather than on airways.

"Inherent in such a concept is the requirement for ultimate separation of airports for different categories of traffic in areas of high density. Also, it would still be necessary to designate certain airspace and areas to meet specific operation and training requirements. . . .

"While directing our combined efforts toward immediate improvements in air traffic control, we must not lose sight of our objective—a common system which best meets the requirements of all users. A true common system *in being* will provide the maximum readiness possible for our nation's total air power."

Major General Kenneth P. Bergquist, USAF
Director of Operations, USAF
Jet Age Conference, Air Force Association
Washington, D. C.

"Security from military aggression is a relative and inconstant condition toward which we strive but seldom achieve. There is no yardstick that one can apply mathematically to a nation and say categorically: "This is adequate" or "that is sufficient" for our security.

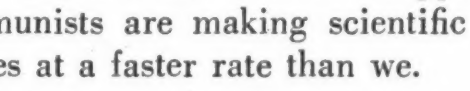
* * *

"Development of sound, long-term security requires stability—stability which is not materially disturbed by every psychological effort of unfriendly nations, or by wishful thinking no our part.

"It also requires that we design our forces so as to assure a steadily increasing efficiency in phase with modern scientific advances. In no sphere of life is there greater activity and progress than in those matters which pertain to war.

"In this regard, whenever our research and development programs produce improvements in weapons which indicate changes in warfare, the Services change the emphasis as rapidly as it is safe to do so."

Admiral Arthur Radford, USN
Chairman of the Joint Chiefs of Staff
Reserve Officers Association
Washington, D. C.



"During the last few decades, we Americans have had a talent in which we reigned supreme. I refer to our talent for production—mass production. When challenged by aggressors, we have always deepnded upon our mass production methods to bail us out.

"Here, gentlemen, is the area of deep concern—the Soviets are presently beating us at our own game—production. They have halved our lead-time on the heavy jet bomber, and in developing and producing all other aircraft, their lead-time is considerably less than ours.

* * *

"No strategist or planner has ever advocated that we must match a potential enemy fighter for fighter, bomber for bomber, and bomb for bomb. What the Soviets think they need may be different from what we think we need. For instance, they have far greater area and a longer border. They are vulnerable to retaliatory attack from all directions. Therefore, the Communist defensive problem is bigger than ours. In their defense-offense equations, they would need far more fighter interceptors than we.

* * *

"One of the reasons that we are dropping behind is that the Communists are making scientific and technological advances at a faster rate than we.

"The fact that the Communists can put not one, but several projects on a crash basis indicates a tremendous capacity for research and development. I add that this also indicates a disregard for cost and for safety factors, and a willingness to gamble.

"We must realize that the defense of this nation is everybody's business, not just our own government's. That is both the price and privilege of democracy. The products of American capitalism, our great corporations, must accept, along with their comparative freedom of action, their share of our national responsibility to provide our own defense."

General Thomas D. White, USAF
Vice Chief of Staff, USAF
General Electric Dinner
Cincinnati, Ohio

THE FORTUNES OF PEACE

America's first successful long-range pilotless bomber—the TM-61 Martin Matador—is a major weapons system conceived and developed in peacetime. And it is helping to keep the peace in an important way.

For the Matador is in quantity production, and already widely deployed. As the first aircraft having complete interchangeability of parts, it is transportable by air and can be delivered unassembled for stockpiling in critical outpost areas.

The new engineering concept that produced the Matador has already revised many design and production standards in the aircraft industry. For this versatile weapons system is being produced at the lowest cost-per-pound for comparable production, despite performance requirements more severe than those for most piloted aircraft.

Today, the new Martin engineering concept is revising the calendar on some of the most advanced flight and weapons systems projects now in the research and development stages.

These are among the Fortunes of Peace!

MARTIN
BALTIMORE

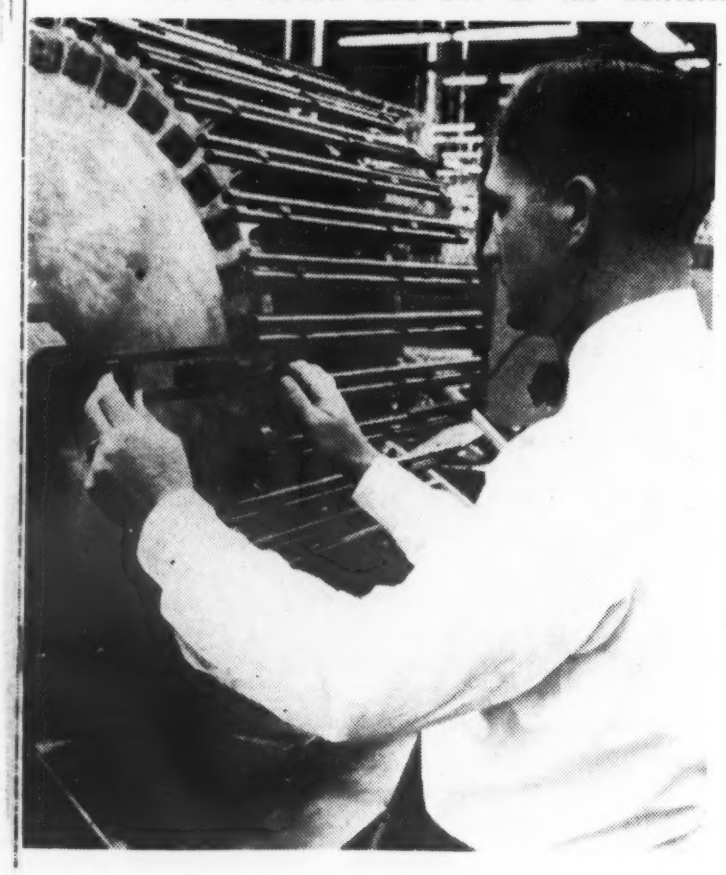
Approaches to Automat

At the General Electric Light Military Electronic Equipment Department, new applications have been found for automation and mechanization techniques that produce small-volume, specialized orders with mass-production methods.

THERE'S A DISTINCTLY DIFFERENT meaning for the words "mechanization" and "automation" at General Electric's three-year-old, 327,000-square foot Light Military Electronic Equipment Department plant at Utica, N. Y.

Usually, these words sketch ready mental pictures of huge, coldly-efficient metal monsters spewing forth thousands after thousands of identical automobile engine blocks, automatic dishwashers, home radios and TV sets, or what-have-you. At LMEED, mechanization and automation carry just as much significance for production lines which turn out military electronic equipment in true job-lot quantities, with the average run numbering in the low hundreds.

This rotating drum of a semi-automatic component placement machine has 40 component magazine carriers, each holding one to three magazines. Each magazine holds between 28 and 68 individual components, depending upon size and type. Below, a magazine is loaded into one of the carriers.



Automatic Methods for Small-Volume Production

LMEED doesn't need mechanization and automation for mass production, but it is convinced that these techniques can make specialized contributions to manufacturing of the department's products—radar, communications, navigation, and other smaller military electronic equipment. The trend toward mechanization and automation at LMEED is gradual and stems from careful manufacturing studies, according to Herman F. Konig, department general manager. He feels that machine programming, usually by punched tape, gives the flexibility vital to the adaption of mechanization and automation to small-volume production.

The department already has made significant strides in automatic testing and has improved many of its manual processing and assembly operations through mechanization. Presently, it is evaluating a semi-automatic component placement machine of its own design and has several other new developments under study. The entire program is designed to produce better, more reliable equipment on time and at less cost.

Results of the program to date are perhaps most apparent in two types of automatic testing which have been in use for almost two years. One type covers automatic circuit testing of printed wiring board sub-assemblies; the other covers automatic functional testing of completed equipments. The automatic testing programs have cut costs, freed technical manpower for other essential duties, sped production, and may lead to even more extensive automatic testing applications.

"Supertester" Saves Time

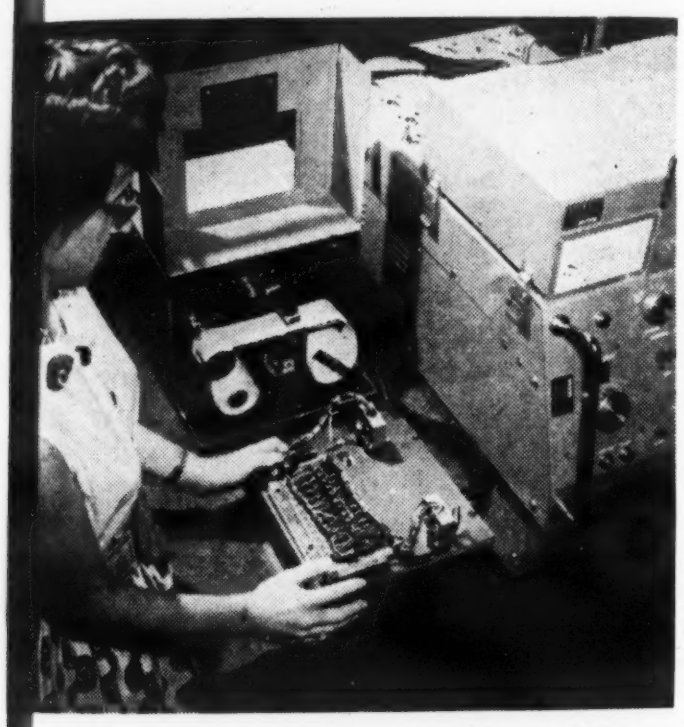
The sub-assembly circuit tester, developed by Color Television, Inc., of San Carlos, Calif., was adapted by LMEED for its own operations as the first such unit in actual production use. Called the "Supertester," the unit performs checks for continuity, leakage, voltage, impedance, resistance, gain or phase relationship on the more than 100 different types of boards used in the plant.

The sub-assembly, with its components installed and dip-soldered, is placed in a special jig which makes contacts at key points. Then the "Supertester" automatically runs through its test series. When it hits a circuit

matic Assembly

by George Tillman

Flexible space saver designed at G-E LMEED is this unusual vertical parts storage bin arrangement called the "ferris wheel." Each of the five vertical sections of the unit holds 50 to 60 set-ups for assembly operations. This enables operators to assemble a wide variety of equipment without moving to individual benches with conventional stacked parts bins. When operators need another set of parts for assembly, they move the correct group of bins into position by hand levers. LMEED engineers figure that this set-up occupies about 150 square feet of floor space, compared with some 900 square feet required by conventional work benches.



One compact workbench holds the "Supertester" automatic circuit test unit which performs the entire test operation on a printed wiring board sub-assembly. Jig, lower left, holds the sub-assembly and makes necessary electrical contacts. The basic tester unit is at the lower right, with the adaptor circuit box on top of it. Printer which automatically lists test results on tape is at upper left.

fault or a component outside rated limits, it automatically prints a code number on a strip of paper to indicate the trouble source, sounds a warning buzzer, and proceeds with the tests.

The operator, alerted by the buzzer, checks the printed results after testing is completed pin-points the trouble source, and corrects it on the spot.

The "Supertester" performs about three tests per second, and requires only 72 seconds to test the most complex sub-assembly used in the plant. The unit also incorporates a "fail-safe" feature which sounds an alarm and stops testing if any failure occurs in the "Supertester" itself.

One such unit, which costs about $13,000 with necessary accessories, currently performs circuit testing of all the printed wiring board sub-assemblies produced in the plant. Only one non-technical operator is needed for the machine.

In contrast, LMEED's cost of testing a run of equipment by manual techniques often previously exceeded the manufacturing cost of the equipment, according to C. J. Statt, department manager of manufacturing engineering. Furthermore, manual testing required seven technical and several non-technical operators.

The other type of automatic tester, which makes operational tests on completed equipments, is programmed by punched tape. The tape sets up various conditions of input, output, or load for the tests.

On one typical equipment produced at the plant, a General Electric-developed functional tester runs through 57 continuity checks, nine network checks, and 20 circuit parameter checks in less than 15 minutes, including time delay for circuit value stabilization.

The functional tester also prints test results on a strip of paper. This localizes any trouble spots, and enables them to be corrected accurately and quickly. Comparable manual testing formerly took about five times as long and did not provide printed test results.

Work with the automatic testers has led LMEED engineers and management to believe that the idea could be adapted for military field use. Such a field tester, in a jeep or small truck, could run rapid go/no-go checks on operational electronic equipment *before* it went into action.

"Ferris Wheel" Storage Bin

Even the common components storage bin has been affected by the plant's mechanization trend. Normally, assembly workers sit at their work stations facing stacked bins of parts. For mass-production work, this is satisfactory, but for small-volume, diversified assembly work it can take up a great amount of plant space with different work benches set up for different assembly jobs.

LMEED's answer to the problem is a towering, movable vertical parts bin arrangement called the "ferris wheel." This unit, 25 feet long and 15 feet high, takes up 150 square feet of floor space and saves about 750.

The unit consists of five rows of bin carriers which travel up and down before the five work stations on belts. Operators move the bin

carriers into position before them by hand levers at each station which actuate the belt machinery. In all, the "ferris wheel" includes 3,000 individual parts bins, with each of the five sections holding between 50 and 60 different assembly set-ups.

The movable vertical parts bin idea also is used in the plant for smaller "ferris wheels" for more specialized assembly operations. These yield proportional savings in space and time.

Typical of the more advanced production machines entering the picture at LMEED is the semi-automatic component placement machine developed there. Before designing this, engineers surveyed their production operation and found that (1) the batch number for printed wiring board sub-assemblies averaged between 25 and 40 per run, (2) boards averaged about 45 components each, and (3) almost four-fifths of the components had axial leads, making them suitable for mechanized placement.

Small "ferris wheel" is single-station movable vertical parts bin. Adapted from the large five-station "ferris wheel," the bins are loaded with components in the order in which operator will install them on a chassis. Color transparencies of completed subassembly, above operator, furnish quick reference aid in assembly work.

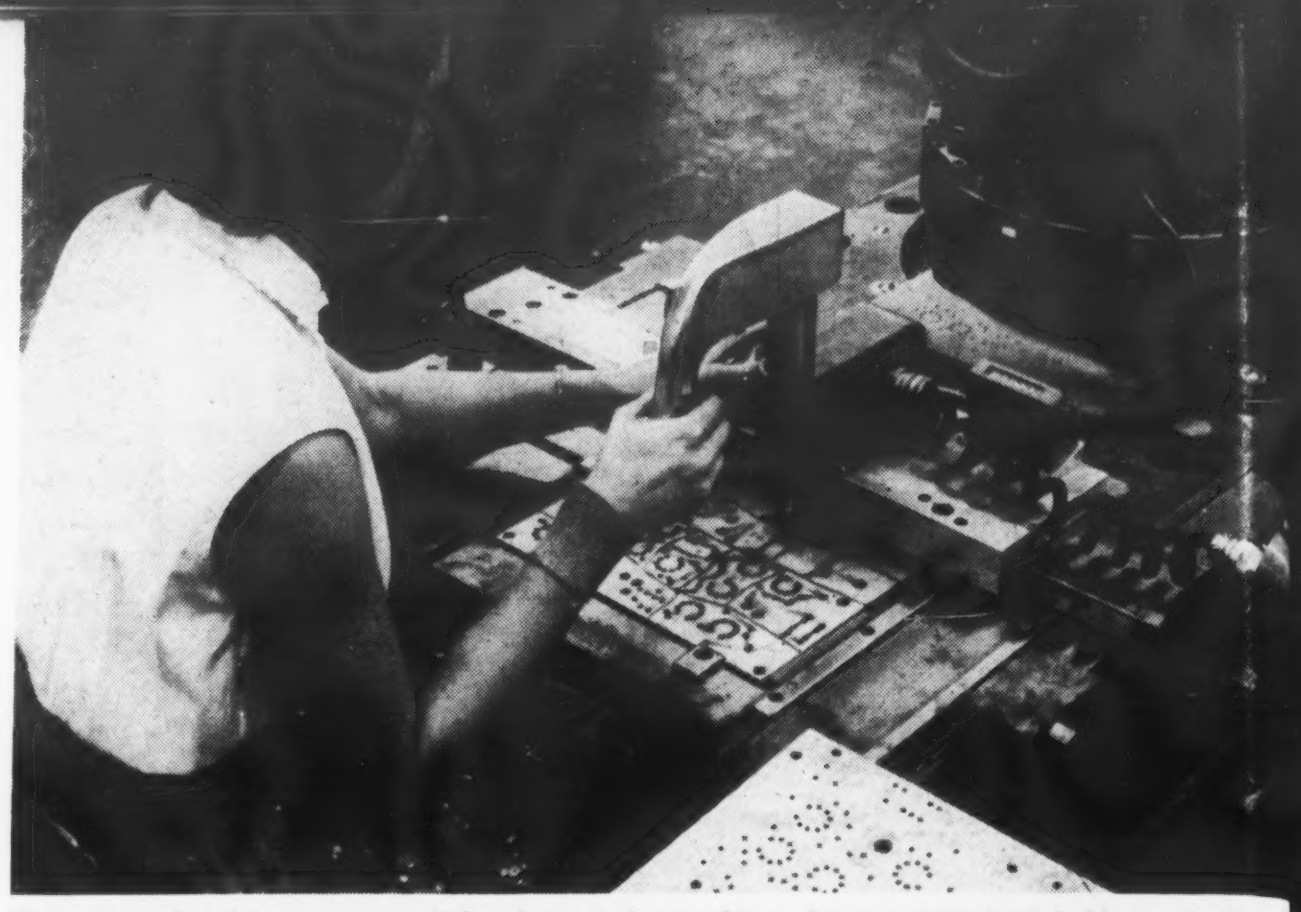
This study proved to the engineers that their need was for an assembly system different from the in-line, multi-station placement systems used for mass production of radios and TV receivers. The LMEED machine would have to be flexible, for varied small-volume output. Accordingly, they set to work developing the machine now undergoing evaluation and further modification at the plant. This has a revolving drum which carries component magazines under a single placement head. The printed wiring board is moved by an operator to the correct placement positions under the head.

Manual positioning of the board under the placement head is done by the operator using a stylus and master template. He positions the stylus in the desired template hole, and the printed wiring board moves along with it to a corresponding position under the placement head. Then the operator pushes a trip-button on the stylus handle and the placement head moves down, picks a component from the magazine beneath it, and continues on down to insert the component leads through the correct holes in the printed wiring board.

As the operator moves the stylus to the next hole in the master template, the drum carrying the component magazines indexes automatically to move another magazine into place beneath the placement head.

The stylus-template positioning method is similar to that used on LMEED Wiedemann punch presses which punch the component lead holes in printed wiring boards. This operating similarity simplifies operator training and later will enable one basic punched-tape programming system to operate both the punch press and the placement machine.

A companion to the placement machine is a component preparation machine which bends and trims their leads and loads them into the magazines. The components are first-loaded manually into a fixture which is then placed in the preparation machine for processing. The semi-automatic component placement machine, which will become automatic when a punched-tape programmer replaces the operator with his stylus and template, is expected to be able to place between 20 and 30 components per minute. This rate is about three times that for manual placement.



Operation of stylus, in operator's hand, controls punching of component lead holes in plastic printed wiring board under the punch press, rear. Operator follows pattern holes in master template and triggers the hand control to punch corresponding holes in the board. Movements of the stylus unit and the semi-automatic component placement machines are similar, in order to simplify operator training and to render both machines equally adaptable to the same basic punched-tape programming system now in development.

The mechanization and automation program in the department is coordinated by groups in both the engineering and manufacturing engineering sections. Their mutual objective is to blend product design with the best known manufacturing techniques. One excellent example is the adoption of a 100-mil incremental spacing for printed wiring boards. This means that design engineers, with a set dimension for their circuit layouts, can produce printed wiring board designs readily adaptable to the mechanized punching and placement operations.

The savings to date in time, technical manpower, factory space, and costs, along with an increase in reliability, have convinced LMEED that mechanization and automation are the keys to the future in military electronics production.

Necessary adjunct to the semi-automatic component placement machine is this component preparation machine which cuts and bends the lead wires of axial-leaded components. The components are manually loaded.

The Army

Command Management School

by Private Ingram J. Paperny
Assistant to the Commandant

The Army is big business and it is the concern of everyone. As citizens and tax-payers the American public has the fundamental right to demand the maximum utilization of the manpower and materials that it places at the disposal of its military leaders. This right is unequivocably accepted by the Department of the Army which is determined to achieve the greatest degree of military security with the funds allocated to it by Congress.

As the Army has grown both in size and complexity of mission, the non-tactical as well as the tactical, the administrative as well as the strategic problems have grown in size and scope. Just as the weapons and techniques have changed, so have the techniques and requirements of military management changed.

Leadership and leadership potential are still the critical and primary elements, but their most effective implementation is determined to a large extent by the new technology of management. The Department of the Army, in complete agreement with progressive American industry, recognizes this fact of modern organization. Here lies the basis for the motto of the Command Management School, "From knowledge the power of decision."

Despite the impressive results of civilian management, it would not do to simply copy the methods that industry had developed to meet its own particular demands. The Army had to adapt these techniques to its own specialized needs. In addition, it was necessary to fashion new tools for the unique problems of the military. What was required, in part, was an educational focal point which would provide the atmosphere and physical plant to encourage the critical examination of the dynamic aspects of good management, predicated on the essential combat mission of the Army.

The answer to this requirement by the Department of the Army was the Command Management School. Since its first class in November 1954, the Command Management School has provided a three week course of instruction for some five hundred students and is now an integral part of the Army School System.

The mission of the Command Management School is "to improve the skills of selected officers and civilians of the Army with the overall view of improving non-tactical management processes throughout the Army." When the Honorable Wilbur M. Brucker, Secretary of the Army, addressed the opening of the Eighth Class on 7 September 1955, he unequivocally supported the efforts made in this direction.

The necessity for *good* management in the Army cannot be over-

emphasized. Any waste or inefficiency in the employment of money, material or manpower is directly reflected in reduced combat power, and combat power is the root and branch of the Army's ability to carry out its historic responsibilities for national security. To have the strength needed for the long pull, strength to see us through any emergency, we must make the best possible use of every resource entrusted to us.

But it is not sufficient to simply define the objectives of good management or even to formulate the program to implement these objectives. Education and training are prime requisites for success. In a letter on the occasion of the starting of the School's second year of operation, Secretary of Defense Charles E. Wilson noted that "no policy or program, however good, will produce the desired results unless it is thoroughly understood and accepted by the people in the field who actually do the work." The Secretary expressed his confidence in the ability of the military leaders, particularly the installation commanders, to take full advantage of the Command Management School and that it "will become a dominant influence in assuring the nation adequate military security without the sacrifice of economic stability."

The School plant itself bears witness to the uniqueness of its role in the Army. Located in Fort Belvoir, The Engineer Center, it occupies a handsome two-story brick building facing the parade field and having a striking resemblance to academic structures all over the country. Thirteen miles from Washington, it provides both contact with a great metropolitan center, and the more relaxed and leisurely atmosphere of the country that is essential for intense and critical discussion. The two-man bedrooms, the comfortable lounges, the large dining room, the well-lighted and ventilated classroom with individual desks arranged in a round table type setting, all encourage the principal activity and product of the Command Management School, informal talk.

The staff and faculty have been carefully selected to provide a representative group of officers with varied experience and backgrounds, and with the technical equipment essential to the mission and methodology of the School. The demand for their services by other Army schools, reserve units, conferences, as well as their university work, is indicative of the effectiveness of their choice. The work and enthusiasm of the enlisted personnel is another important factor in the functioning of the School, and their "school spirit" and loyalty has frequently been noted and commended by the senior officers.

The staff and faculty are augmented by and receive valuable assistance from expert staff personnel from the Department of the Army as well as distinguished representatives of Government, the universities, industry and the trade unions who participate in the guest lecturer program.

A School is established and maintained for its students and its real character is determined by them. This is particularly true in a school, like the Command Management School, in which the students are part of the faculty and unusually active in the teaching process. The students are senior officers or civilian officials averaging twenty-three years of active service from the rank of Lt. Colonel through Major General.

On the basis of present trends, at the end of two years of operation, one of eight colonels in the Army will have attended the course, as well as approximately fifty general officers. These are the Army's top managers. They are the decision-makers. Their positions make them responsible for the efficient operation of the vast complexity that is the Army, the biggest business in the world.

The primary instructional goal is to create the physical and mental environment conducive to creative and critical thinking. The School encourages, yes, even demands the free play of ideas and, in common with many of the major universities, has established the case method as the principal instructional tool. *The purpose of the case method is not to teach dogmatic laws but to teach men to think in the presence of new situations and to base their decisions on knowledge, not prejudice.*

The cases studied at the Command Management School are records of management incidents which have actually taken place on military installations. These situations form the basis for vigorous discussions by the participants and stimulate a most valuable interchange of management approaches. Customarily each case is scheduled for fifty minutes of classroom discussion. Prior to the class room the cases are studied by the individual participants and then discussed in the smaller lounge groups of eight to twelve members. This kind of discussion, the vigorous examination of a factual situation is not academic debate but is an exercise in decision-making.

The faculty member is not primarily an instructor. He is a discussion leader, a moderator, encouraging the participants to examine and dissect the problems. It is essential that he create a permissive atmosphere in the classroom. His job is to guide the movement of learning. As a responsible member of the group, he may express his personal views, but there are no school solutions announced or even implied at the Command Management School.

(*Continued on page 32*)

From the Commandant

The dynamic changes now being made in the management procedures of the Army deserve the most critical attention by the combat and support elements as well as all those interested in the effectiveness of our Army. Today's commander is also a manager and must be well versed in new tools of his trade. We at the Command Management School are proud of our mission "to assist Installation commanders and senior staff officers and civilians to perform their managerial functions in a more effective manner" and equally proud of our motto, "From knowledge the power of decision."

FRANK KOWALSKI, JR.
Colonel, Infantry

Colonel Kowalski

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Undersea Lifeline

A panoramic view of the sandy shores and expanse of ocean along part of the cable route. At the right are the runways of Patrick AFB, Florida, and in the upper left Cape Canaveral juts out. White puffs are clouds.

IN 1949, THE U. S. AIR FORCE foresaw a need for communications to connect its 1,000 nautical mile guided missile range from Cocoa, Florida, and across the Bahama Islands to Mayaguez, Puerto Rico. That same year, Congress approved the establishment of a long-distance range for testing guided missiles. Headquarters for the Air Force Missile Test Center was established at Patrick Air Force Base, Florida. In 1951, administration of the range was assigned to the U. S. Air Force as part of the newly created Air Research and Development Command.

Nerve center of the vital communications network required in testing missiles is a submarine cable stretching from Cape Canaveral southward for 1,300 miles. From the Cape, the cable runs to Jupiter, Florida, then loops down to Grand Bahama, Eleuthers, and San Salvador. It then island-hops to Mayaguana, Grand Turk, the Dominican Republic and, after snaking through 23 attended and unattended repeater stations, terminates at Mayaguez, Puerto Rico.

Under normal conditions, the cable system provides 12 voice channels down-range—from Cape Canaveral to Puerto Rico—over a frequency band from 4 to 52 kilocycles; 12 voice channels up-range—from Puerto Rico to Canaveral—over the frequency band from 60 to 108 kilocycles; and a two-way order wire circuit from 0 to 4 kilocycles for cable maintenance purposes.

Each carrier channel is of speech-quality transmission over the frequency range from 250 to 3,100 cycles. Two adjacent channels can be grouped into a single broadband channel capable of transmitting a bandwidth of 5,000 cycles for program use either up- or down-range.

During missile tests, two down-range voice channels can be converted to a channel for transmitting telemetry signals at a frequency of 10,500 cycles at down-range stations. Another channel can be used to transmit a timing signal to each of the down-range stations to synchronize local timing generators. Timing signals are synchronized within a few microseconds or less.

Also during tests, the frequency

THE LAUNCHING SITE

ARDC launching site for long-range guided missiles is at Cape Canaveral, 18 miles north of Patrick Air Force Base, Florida.

Principal components of any launching, aside from this missile itself, are the launching pad, the blockhouse, and the central control building.

The launching pads are thick slabs of concrete 100 feet square upon which the missiles are set up and fired.

Electric wires and cables run through a concrete tunnel to the blockhouses, squat concrete structures which house the firing controls. In some blockhouses periscope windows offer the crew a safe view of a launching from either of two pads from their subterranean control room.

Once the "bird" is in the air, the central control building takes over. It contains the complicated electronic equipment for guiding the missile, receiving telemetered data from the missile, tracking it with its radar, and for giving the radio signal which will explode the missile at the proper point in its flight.

This is the story of a communications lifeline linking 1300 miles of the world's largest outdoor laboratory. Today, the lifeline permits Air Research and Development Command scientists to track, plot the position, speed, altitude and flight path of guided missiles being tested at the Air Force Missile Test Center.

by Colonel William Donics, USAF

Assistant Chief, Radar & Communications Division
Directorate of Development, Hdqrs., ARDC

bands of three up-range voice channels are combined with the frequency band just above the up-range voice channels to furnish a broadband channel. Operating between 105.5 and 150 kilocycles; the channel is used to transmit 11 telemetry subcarrier channels with center frequencies between 1.5 and 40 kilocycles on a carrier basis.

Telemetry data, such as speed, engine temperature, altitude, etc., are transmitted on the broad-band channel. After receipt at a down-range station by radio from equipment within the missile, the data then is retransmitted by cable to the control center at the launching site.

Details of Cable Construction

Basically the cable is of the coaxial or concentric type. The central conductor consists of a solid copper wire .131" in diameter covered by three closely conforming tapes .014" thick. With the overlap, the combination has a diameter of .160" and is in turn covered by polyethylene insulation, which builds up the diameter to .620". The outside, return, conductor is made up of six copper tapes .016" thick. A copper tape .003" thick is wound with overlap to protect the insulation from marine borers.

Of sturdy build, the cable can withstand hydrostatic pressures on the ocean bottom. But for protection from anchors, fishing gear, and abrasion on the ocean bottom, the cable is protected by a sheath of steel armor wires bedded between layers of jute.

Cable laid near shore is fitted with two layers of mild steel wires each of which is .3" in diameter. For less severe shore conditions, the cable is armored only with a single layer of

Radar and telemetry units such as these span the islands along the guided missile course. The "machine gun" like device to the right is a telemetry antenna, used to pick up radio messages from the missiles.

the .3" wires. Cable laid in shallow seas, which in some cases extend for considerable distances, is protected with a single layer of .160" to .200" diameter mild steel wires. The deep-sea sections are armored with .090" high strength steel wires.

Cable Laying Operation

All deep-sea cable was laid by the *HMS Monarch*, owned and operated by the British Post Office. Displaceing approximately 8,050 tons and capable of carrying 2,600 miles of cable, the ship is the largest of its type in the world. Her normal crew consists of about 130 officers and men. The four cable tanks of the *Monarch* hold more than 2,000 miles of deep-sea cable.

Started in May 1952 and completed in July 1954, the deep-sea cable was laid in four operations. About 1,365 miles of cable was laid in 23 sections with 48 landings. The number of sections laid and the landings made are unprecedented in cable-laying history.

At one point in the system the cable lies two and a half miles below the surface. At the repeater and terminal sites and at other points it rises out of the water. Because of variation in the depth of the water and the movement of the sea, the cable had to be manufactured in different thicknesses and strengths. Although the cable has only one coaxial, or center conductor circuit, it operates on the carrier principle. This is a system whereby two-way messages can be transmitted simultaneously over as many as 12 high-quality talking channels. In fact, personnel down-range can merely pick up a phone and talk to their parties on the mainland as easily as you make a long-distance call to San Diego, California.

A transmitter maintenance and operations engineer adjusts the controls of a transmitter in the transmitter building located at the Cape Canaveral missile launching site.

Many people may assume the cable is of continuous length, but such is not the case. Actually, the cable is composed of eight major sections which link together nine range bases as far as Puerto Rico. In addition to these nine attended stations, 14 unattended sites are scattered all along the cable route.

A typical attended site consists of two filter huts and a repeater station. The filter huts separate up-range and down-range circuits and clear them of interference. Both circuits lead to the cable room where, after additional filtering and amplification, they are connected to the single coaxial. Unattended repeater sites also separate, filter and amplify the two-way circuits.

Necessity for Good System

Engineers estimate the submarine cable should serve its purpose for the next 50 years. Costing some eighteen million dollars, the cable enables scientists to gather missile data more quickly and more accurately.

Split-second communications are needed in testing missiles. From the time a missile takes off, a radar "locks" onto it and follows its every move. Watchful eyes—human, photographic and electronic—check the missile until it dives into the sea. Down-range, other eyes and other instruments, geared to the same time impulse, take over guidance and recording functions as the missile approaches their areas.

Launching a missile requires timing and coordination between the launching area and the island control stations. Separated as they are by hundreds of miles of tropical seas, no missile could be launched without an intricate yet highly dependable system of communications. A most important part of that system is the 1,300-mile submarine cable.

Within the next few years, ARDC's missile test center will assume increasing importance. Here, tests which may spell out security for the free world will continue as the U. S. Air Force strives for qualitative superiority over its potential enemies. Accurate and dependable communications will make a major contribution to that superiority in the current struggle for survival.

Pictured below are some of the activities involved in the cable laying operations. Whenever the waters proved too shallow for the HMS Monarch, a barge brought the cable closer to shore and long liners supervised the operations, as pictured in the photo left. On the right, aboard the Monarch, members of the crew splice the cable which will later be lowered into the sea. The simple devices the men hold are important in keeping the wires from becoming entangled.

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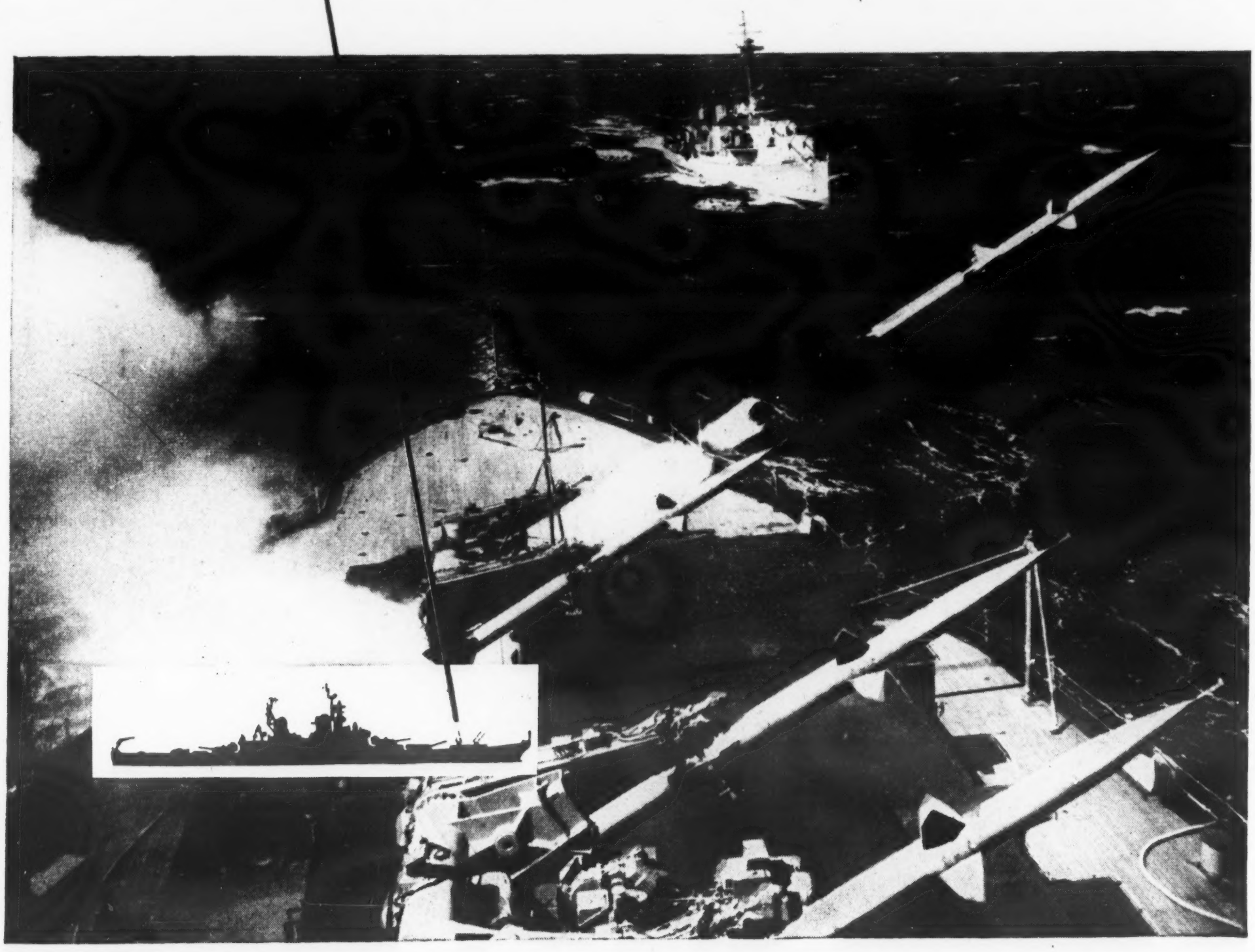

another AFCEA chapter activity

Armed Forces Regional Industry Symposium

The AFCEA Philadelphia Chapter, with the Department of Defense and six other associations, co-sponsored this meeting of over 800 industrialists and businessmen from the Greater Delaware Valley area on January 19 & 20.

We present some excerpts from a few of the talks at the Symposium.

"We have the greatest production potential and the most dynamic technology the world has ever known. But, just as every businessman knows that contacts aren't customers, every military man knows manpower isn't an army—so, we must always be mindful that industrial potential isn't war production.

"Modern war is a head-on clash of total economies, total resources, men, machines, materials—your effectiveness is determined by your ability to organize your total economy. This creates complex requirements.

"The requirements of a total economy break down into three general categories:

(1) Essential civilian requirements; These are the absolute necessities to keep your economy functioning. These are the materials for water supply, sewage disposal, fire fighting, police protection, hospitals, food, clothing, shelter.

(2) Defense supporting requirements: These are the things necessary to maintain your industrial economy so that it can produce military items. For example, freight transportation, communications, repair, maintenance, operating supplies, raw materials, electric power.

(3) Direct defense requirements: These are the guns, planes, tanks, ships, ammunition, missiles, etc., that are directly used by the Army, Navy and Air Force.

"These last, the direct military requirements, are the ones with which we are primarily concerned at this meeting. However, before I proceed, I want to emphasize that all three kinds of requirements are essential to the pattern of preparedness—they are the legs of the tripod on which our mobilization base rests. Take away any one leg and the tripod collapses.

"Business and Defense Services Administration of the Department of Commerce is primarily concerned with essential civilian and defense supporting items, while the Department of Defense is responsible for planning for direct military items.

* * *

"We started World War II with the most gigantic game of hide-and-seek on record. Everybody was 'it'. Thousands of industrialists descended on Washington to find out who in the military bought what. At the same time, thousands of military men scoured the country trying to find who could make what. . . .

"It is elementary, therefore, that if we are not going to have a big game of hide-and-seek next time, we had better match up our military producers and our military products now. *For sustained readiness: the military must always know—who can make what, how much can he make, how fast. Industry must always know—what military agency wants what, how much, how soon.*

"This business of matching up wartime products and wartime producers is mobilization planning. It is my business and it is your business.

* * *

"This is accomplished by having the military and industry sit down together and do across-the-table planning in peacetime. By having the buyer and seller discover each other now, we hope: to eliminate wartime hide-and-seek; to spread the mobilization impact more evenly across our capacity, and to get better utilization of each plant since management has an opportunity to plan the use of its own plant.

"Admittedly, this is a good ambition, but how do you make it work? Well, to start with, everyone concerned

At the recent Armed Forces Regional Industry Symposium, three of the speakers look at a blackboard diagram used to illustrate the talk given by Mr. J. Lewis Powell. Left to right: Mr. Lloyd H. Mulit, director of requirements, procurement and distribution, Office of the Assistant Secretary of Defense (Supply & Logistics); Mr. Powell, program coordinator, production allocation program, Office of the Assistant Secretary of Defense (Supply & Logistics), and Brig. Gen. William L. Bayer, commanding general of the Signal Corps Supply Agency in Philadelphia and chairman of Symposium.

has to know who is planning with whom. We have a book called the Register of Planned Mobilization Producers. This lists the plants with whom we are planning and it cross references each plant listed to the military departments that are planning with it. This is the "Official Directory of Planning." For each plant listed, it also shows who is the Armed Service Procurement Planning Officer, commonly called as ASPPO.

"It is quite important that you understand who and what an ASPPO is. His job is to represent all of the Armed Forces and act for the Assistant Secretary of Defense in coordinating all the military planning with that plant. Anyone wanting to plan with your company must funnel his request through your ASPPO.

"There are two things you should do with your ASPPO: (1) help him make a good informative survey of your plant, and (2) build your production know-how into mobilization production schedules before you sign them."

J. Lewis Powell
Office of the Assistant Secretary of Defense (S&L)

"Industrial mobilization planning is a dynamic activity of our Government. This planning is constantly moving and changing and, therefore, is constantly in need of new ideas.

* * *

"I believe that the new Air Force policy on "production readiness" is a good example of this kind of progressiveness which is needed today.

Vice Admiral E. D. Foster, USN (Ret), vice president for economic planning, Radio Corporation of America, and Mr. Jack P. Barkow, plant manager of the RCA Camden division and president of the AFCEA Philadelphia Chapter. Admiral Foster spoke at the Symposium on "Industry's View of Mobilization Planning."

". . . Let me make a few remarks about it in order to explain its meaning for all of the military services. First, under this policy, the Air Force will continue to plan as heretofore for most of its aircraft, weapons and supplies. But, for a few highly important aircraft which would be needed at the very outset of any future general war, plans will be made with selected manufacturers to very rapidly increase their production rates. These aircraft would include a particular strategic bomber or a defense fighter; possibly guided missiles would be included under this category.

"At the same time, under the policy, the Air Force is choosing a few other items which would be needed quick-

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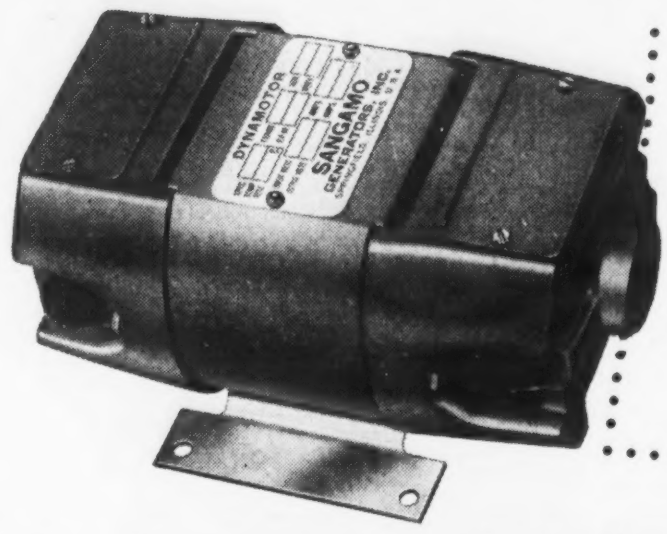

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This small, rugged dynamotor is ideally adapted to small transmitters. It provides a dependable power supply under the most exacting conditions. Meets MIL-D-24 Specifications for aircraft, marine, and "Hi-Gee" (missile) usage. Wattage ratings up to 75 watts for continuous duty, 200 watts intermittent. Input voltage 6 to 115. Output voltage up to 750.

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Vice Chief of Naval Material, "Naval Industrial Mobilization Planning Program"

Col. Warner E. Newby, USAF
Chief, Industrial Mobilization Division, Directorate of Materiel Programs, Deputy Chief of Staff, Materiel, USAF, "Air Force Industrial Readiness Policy"

ly in the event of a future localized aggression. These would be primarily tactical and Army-support aircraft. A late model fighter or transport plane would come under this category. . . .

"Our office reviewed this policy with the Air Force for some months before it was put into effect. We are encouraged by its possibilities to overcome some of the new problems which have arisen because of the introduction of nuclear weapons. You realize, of course, that the wartime missions of the Army, Navy and Air Force are different—that each would have its own important part to play during different stages of any future war. We believe this Air Force policy fits in with the particular wartime job of the Air Force. The Army and Navy are also constantly exploring new methods to carry out their missions in any future aggression. It is our responsibility in the Office of the Secretary of Defense to make certain that the plans of any one service give full consideration to the needs of the others, and to insure that whatever kind of planning is beneficial to one military service is made available for use by the other military services."

Lloyd H. Mulit
Office of the Assistant Secretary of Defense (S&L)

"The Army's basic approach to preparedness is necessarily two-fold: We need, first, certain reserve stocks of finished military supplies, and we need, second, a production base that can be relied on to turn out the needed munitions in any future conflict. The key to successful planning is to work out the soundest possible balance between the stocks of finished weapons and the production potential. This is a complicated problem and I cannot go into a full explanation of the methods we use for solving it. I can only say that beyond keeping our peacetime Army fully equipped with the best and most modern weapons, it is our policy to keep war reserves as small as we prudently can do. For one thing, finished weapons and munitions are expensive to buy and expensive to maintain. The even greater difficulty lies in their becoming obsolete in our age of rapidly changing technology. It is, therefore, of the utmost importance to have an adequate production base in being which can be expanded to its needed wartime size in the early mobilization period during which the Army will use its accumulated war reserve stocks."

Maj. Gen. H. R. Westphalinger, USA
Office of the Deputy Chief of Staff for Logistics, USA

Command Management School

(*Continued from page* 24)

The case materials and the discussions are intensely practical and realistic. They accurately reflect the situations and thinking that are intimately woven into the life of an Army officer. These are not laboratory contrived incidents, but flesh and blood problems that stir the memory of all in the classroom. A Post Commander awakens one morning to find his main gate picketed by union members and no trucks entering his post because non-union construction workers have been hired for a small project; a directive is received at an Army hospital specifying the exact procedure for counting used linen but it is soon realized that this will entail a far greater expenditure of time and money than could conceivably be saved; a post located near a small rural community is faced with growing hostility on the part of the townspeople. These are real problems and the solutions proposed are realistic.

It is obvious that the management course at the Command Management School does not lend itself to a statistical statement of achievement. It cannot be determined how many man hours have been saved, or how many dollars. But there is a good idea of what the course has meant to the participants. Their letters, whether in response to a questionnaire or simply out of enthusiasm, echo with the same statements on the value of the Command Management School in enlarging their perspective and in making them aware of the many nuances of managing. They are grateful for the opportunity to meet with their colleagues and to talk things over, and they are pleased that the policy makers in the Department of the Army are taking advantage of the School to discuss policy matters with the command managers. It has given them a better understanding of the different functions that the command manager will be called upon to assume.

Avco Lycoming makes more time for business

Challenged by a surging economy, the most urgent single need of business today is *time*. Today, business gains that time through flight. A growing private airfleet—already larger than those of all scheduled airlines—is shortening the distance between appointments.

To power this bustling fleet—so safely and so dependably that a twin-engine plane can fly and land on *one engine alone* if necessary—business looks to Lycoming. More *Lycoming* engines roar in today's advanced executive aircraft than any other engines in the world. And Lycoming supercharged engines, the first available to business, are driving private aircraft higher and faster than ever.

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Find out how private flying can save you time. Write for booklet, "The Review of Executive Aircraft." Or for help on any problem involving Power—wire, phone or write to Avco Defense and Industrial Products, Stratford, Conn.

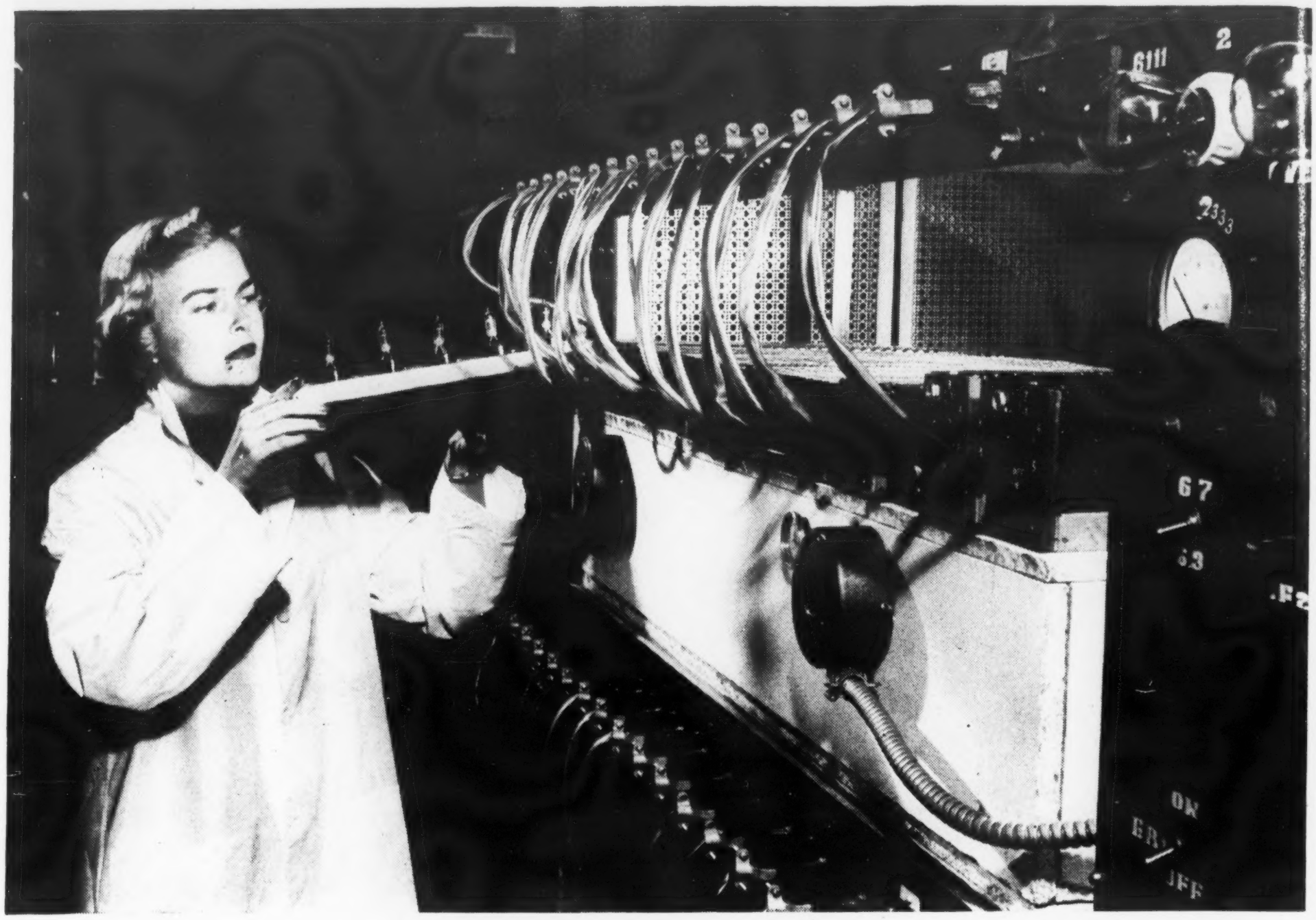
ENGINEERS WANTED: Rewarding careers for outstanding men. Write to Vice President, Industrial Relations, Stratford, Conn.

Avco Lycoming

defense and industrial products

Avco Defense and Industrial Products combine the scientific and engineering skills, and production facilities of three great divisions of Avco Manufacturing Corp.: Lycoming; Advanced Development; Crosley—to produce power plants, electronics, airframe components, and precision parts.

FOR A COPY OF THIS BECK ILLUSTRATION, SUITABLE FOR FRAMING, WRITE TO PUBLIC RELATIONS DEPT., AVCO DEFENSE AND INDUSTRIAL PRODUCTS, STRATFORD, CONN.



G-E 5-Star subminiature tubes are life-tested at temperatures above 220 C!

OVEN-HEATED to twice the boiling point of water, General Electric 5-Star subminiatures operate for three weeks in a factory test that demonstrates their reliability for long intervals under extreme temperature conditions.

If any variations in electrical characteristics are disclosed during the 500-hour period, they must prove so slight that the change will be within closely specified limits. Lots of 20 tubes —all from current 5-Star production—are chosen at regular intervals for the life test. Thermocouple readings are taken to assure that the tube envelopes are heated to the 220-degree minimum.

In military service, the heat self-generated by tubes working to capacity is further increased by heat from other components, from air friction, from engines. Also, the compact size of electronic equipment often makes it hard to cool tubes through air circulation. It is vital that tubes be dependable at high temperatures. The oven test is specifically directed to this end.

General Electric 5-Star subminiatures meet every military requirement for reliability and long life in hard service. A wide selection of types is available. Ask for G-E 5-Star Tubes in new equipment! Install them as replacements! *Tube Department, General Electric Company, Schenectady 5, N. Y.*

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164-1A2

TELEMETERING

and the study of vibration of rockets in flight

by Paul E. Wilkins
Electronic Scientist
Diamond Ordnance Fuze Laboratory

ELECTRONIC EQUIPMENT IN GENERAL has become more and more rugged as the applications of electronic science have grown. The automobile radio or marine and aircraft communications equipment, which less than three decades ago would have been rendered inoperative by the shock and vibration encountered in these relatively mild environments, are common today. Communications equipments for the armed services, including such items as transmitters, receivers, radio teletype equipment, gun directors, and radar equipments, have been developed to the point where they perform their functions reliably in front-line tactical operations.

Present ordnance requirements for electronic equipment demand extreme ruggedness, reliability and safety. Electronic systems must be capable of being fired from a gun, launched on a rocket or dropped suddenly from a bomb bay into an airstream, traveling at speeds up to 600 miles per hour and higher, and having passed this test, must go on to accomplish the mission with a high degree of accuracy.

One of the first steps in the development of electronic equipment to fulfill military requirements is the determination of the forces and conditions that are acting on such equipments during actual use. For our purposes, a new branch of instrumentation called *telemetering* has been developed. The word telemeter is of Greek origin and means "measurement at a distance." The implication here is quite clear, for obviously the measurements cannot be made by direct observation on a falling bomb or a mortar shell in flight. Indirect measurement techniques must be used to obtain the desired information and the data relayed to a ground station.

One of the methods devised for obtaining remote information is through the use of a class of devices known as transducers which convert an unknown quantity, such as heat, light, sound, force, etc., into an electrical signal which is directly related to the magnitude of the unknown quantity. Several examples of such devices are microphones (sound), thermacouples (heat), photocells (light), and accelerometers (force). Each of these devices changes the effect into an electrical signal. Now, having been converted into an electrical signal, the unknown quantity may be transmitted over great distances by wire or by radio.

A great variety of these transducer elements are available, for it has been possible to develop an electrical signal from almost every known physical effect. This is one of the underlying reasons for the great growth of the science of electronics, for these transducers make possible the charting of minute changes within the heart of the atom or the position of a distant galaxy with a radio telescope.

A complete radio telemetering system consists of the transducer, a

Figure 1. Telemeter package with the accelerator transducer shown on the right.

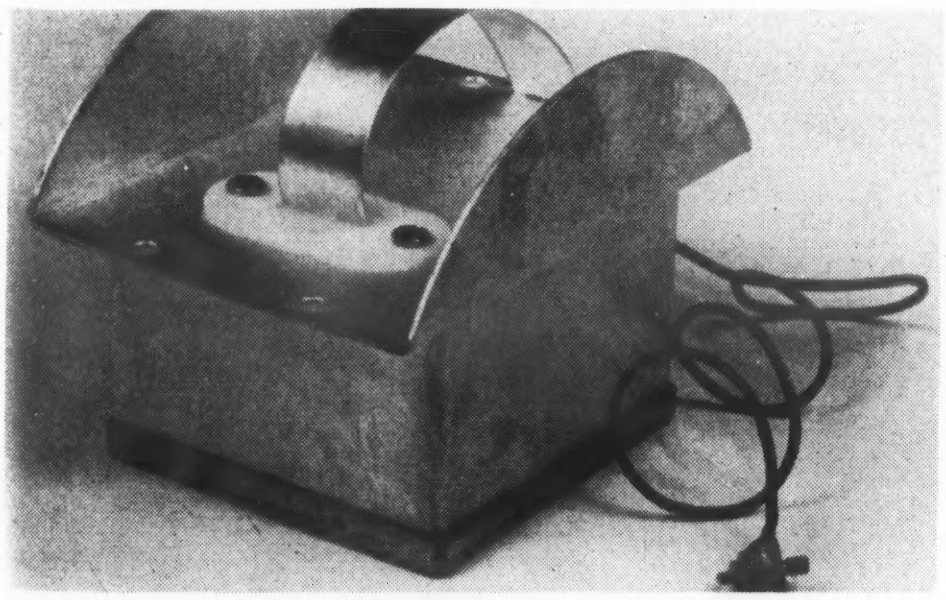
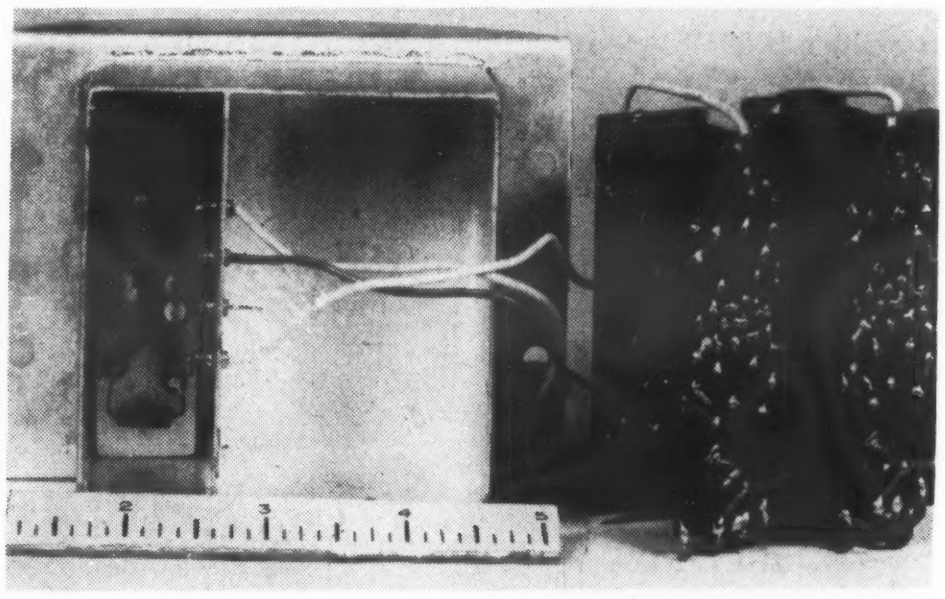


Figure 2. Components of the telemeter package which transmits data from missile or rocket.



radio link to transmit the electrical signal from the transducer, a receiving location within the range of the telemeter transmitter, and a recorder to make a permanent record of the information. By using such a system, measurements can be made of phenomena in difficult or hazardous locations, and, what may be just as important, the system provides a permanent record which may be used a great number of times and in a variety of ways. In effect, the same bomb may be dropped many times within the laboratory by replaying the tape record of the telemetered information. This technique permits a more careful study of the information and a wider application of the data obtained.

The Diamond Ordnance Fuze Laboratory has been faced from time to time with the desirability of determining the strength and frequency of the vibrations of the motor and the warhead of a rocket during the launching period and the free flight of the missile through the air. When these factors are known, they provide guide lines around which the mechanical design of electronic equipment for rocket-borne applications may be carried out. If a measurement of the vibration characteristics is not available, the design must be carried out through trial and error. Thus, if the telemetering can be accomplished reasonably, it may result in a considerable economy in the development process, reducing the number of expensive trials.

Figure 1 shows the telemeter transmitter package developed by the Laboratory for use in a rocket vibration study. The transducer is shown to the right and is a crystal of barium-titanate. This crystal has piezoelectric properties, i. e., an electrical signal is produced across the crystal faces when a force is applied on the crystal. This small signal is amplified and used to modulate the transmitter in the telemeter. The small strap is the transmitting antenna.

The outside configuration of the telemeter is such that it will fit into a slot in the side of the rocket head and complete the contour of the head without disturbing the ballistics of the rocket.

Figure 3. A mobile telemeter ground station.

Figure 2 shows the component parts of a telemeter which will handle two channels of information, in this case the transverse and longitudinal vibration components of the warhead of a rocket. The two subassemblies are the amplifiers and modulators which are built on etched-circuit boards. The complete telemeter employs nine subminiature vacuum tubes and is powered by batteries which are carried inside the warhead. In telemeter jargon, this is an FM/FM system since the intelligence is transmitted over the radio link by double frequency modulation.

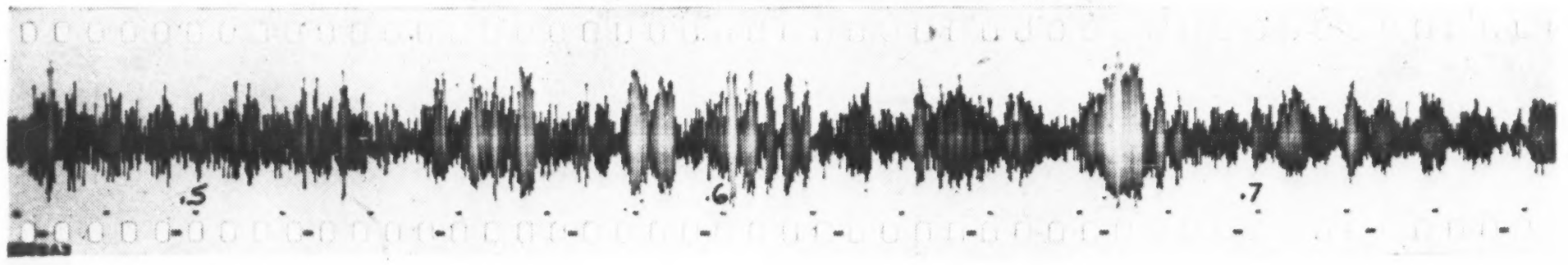
A mobile ground receiving station is shown in Figure 3. The antenna which picks up the radio signal from the telemeter is mounted on the roof of the truck, and within the truck are the receivers, demodulators and recording equipment.

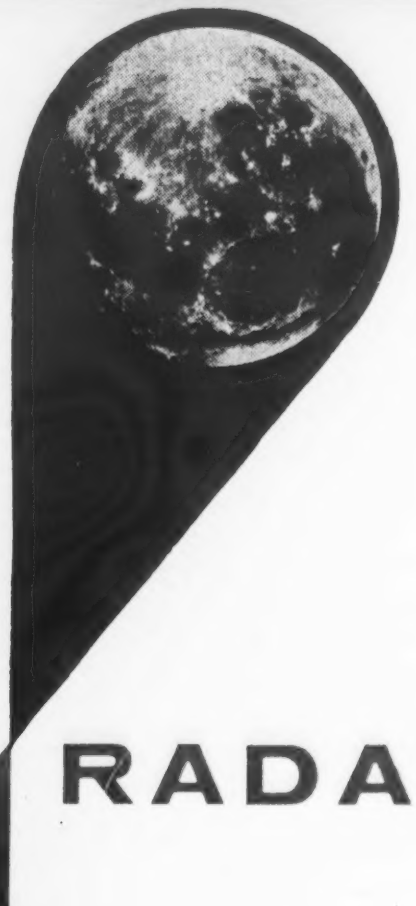
A strip from a graphic recorder is reproduced in Figure 4 to show the nature of the recorded data from one of the rocket vibration studies. When the rocket propellant is ignited and begins to burn, the accelerations in vibrating elements can build up to 50 or 100 times the acceleration due to gravity, and the vibrations may have frequencies from 50 to 20,000 cycles per second. As the burning proceeds, the amplitude of the vibrations decreases until as the propellant burns out there is another increase in amplitude. After the burning period, the flight is comparatively quiet, with the rocket experiencing vibrations of 10 to 20 times gravity as it rides through the air. This vibration in free flight is due to aerodynamic effects. If the speed of the rocket exceeds the speed of sound, the point in the trajectory where the rocket goes through the sonic barrier is marked by an increase in vibration caused by the formation or collapse of the shock wave.

In the attempt to gather information about the vibration of the rocket, such other additional information as burning time, acceleration, velocity, drag information and total flight time may be acquired. All this information is valuable and is difficult to obtain in any other way. Static tests of rockets cannot always give accurate information about rockets traveling through the air.

Telemetering as a branch of instrumentation is in its infancy, but must grow as the frontiers of science are pushed forward. Through telemetering, information can be gathered about atomic processes in places unsafe for human beings The application outlined here demonstrates how telemetering is being applied in the solution of difficult problems in Ordnance equipment to provide more effective, rugged, reliable and safe equipment for use by the Armed Forces.

Figure 4. A typical telemetered record of rocket vibration.





DIANA RADAR

In this age of man-made satellites, knowledge of space is being expanded by the moon radar system now in operation by the U.S. Army Signal Corps at Belmar, N.J.

Both the transmitter and receiver, which were designed and manufactured by REL, are held stable by a single crystal to better than one part in 10^6. Output power is 50 kw, and frequency is 151.11 mc. The receiver noise factor is better than 3 db, with gain of 170 db.

REL's world-famed experience and facilities are available for the solution of your specialized radio problem.

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High speed facsimile scans bank slips, accounting & newspaper columns, etc. at the rate of 3600 lines per minute.

by David O. Moreton

The Alden Story

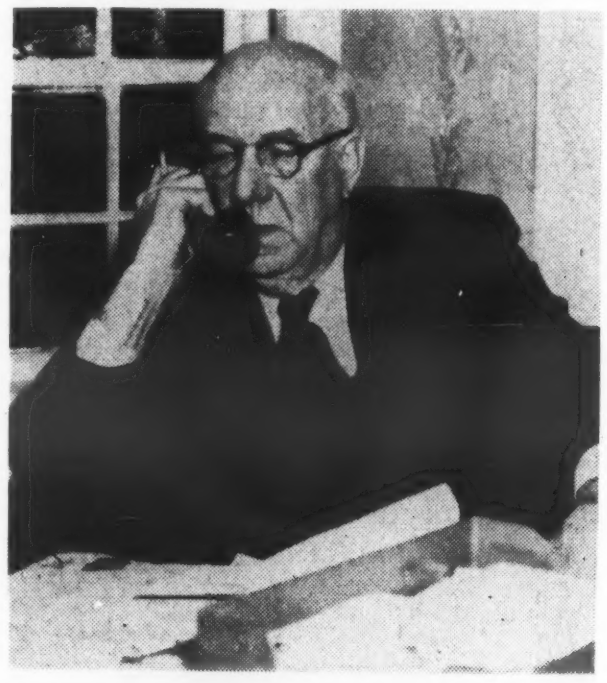
Four active companies make up this New England team

IN THE EARLY 1930's, MILTON Alden, founder of the Alden Products Company, produced his first facsimile equipment. This was not his first venture into electronics. The Alden Napiers Company, from which developed the "NA-ALD" trade mark on a line of radio components, was started in Springfield, Massachusetts, in 1920. Later its name was changed to Alden Manufacturing Company, and in 1930 the Alden Products Company was formed, continuing the manufacture and sale of NA-ALD products.

Today, the four-company structure of the Alden organization, which at peak periods employs up to 500 people, is this:

1. The Alden Products Company, Brockton, Mass., manufacturing components, housings, connectors, and sub-contracting in the electronics field.
2. Alfax Paper & Engineering Company, Westboro, Mass., makers of "Alfax" facsimile paper exclusively.
3. Alden Systems, Inc., Westboro, Mass., designing, assembling and merchandising the "Alden Work Center," assembly lines, tote-boxes, "ready-count" parts boxes and packaged facsimile.
4. Alden Electronic & Impulse Recording Equipment Company, Westboro, Mass., designing, assembling, marketing and servicing special facsimile and instruments.

Milton Alden, founder and president of the Alden organization.



The operation at Westboro is called The Alden Research Center, and at present employs about 60 people. Light manufacturing and assembly for Alden electronic products is conducted at the Westboro plant, which at the same time is an ideal proving ground for the operations and methods of Alden Systems, Inc. Alden Products Company supplies the components and heavier fabrications.

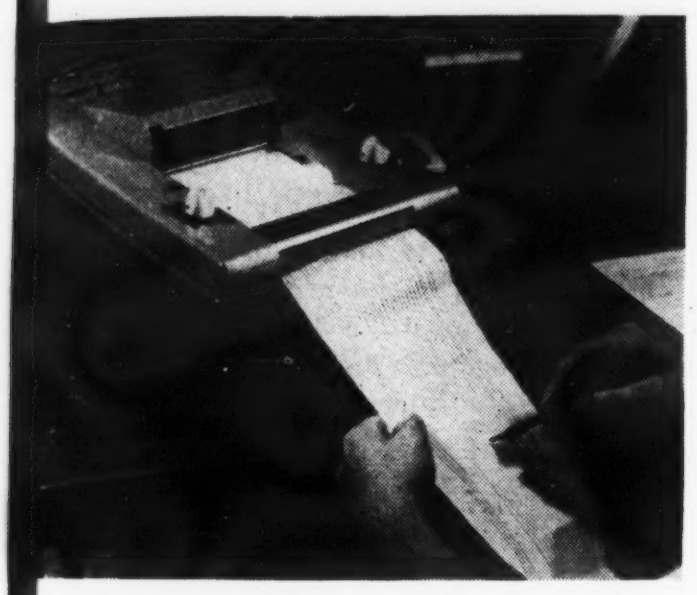
The Alden organization is a hard core of trained engineers and executives who can not only design products, but make them work and even sell them. The key men at Alden are: Milton Alden; John Alden, his son

nd manager of the Brockton operations; Charles Sviokla, chief man in Alfax Paper and manager of operations at Westboro; E. D. Cross, director of Alden Electronic facsimile, and Horace B. Hills, sales manager of Alden Electronic.

From the start, as a radio components manufacturer and sub-contractor, Milton Alden had to pace his production to research that made equipment obsolete overnight. He had to then—and today still does—literally change his assembly lines from one day to the next. The result was that methods and work facilities based on extraordinary flexibility were so practical, well designed and economically manufactured, that these themselves have become a business.

Facsimile's Position

Of primary importance in the transmission of highly important or



A 30-channel graphic recorder.

technical information is the competance of the operator. The accuracy of both the transmitted and received message lies with this skilled person who must translate the original copy into individual punctuated words and letters, which will then be keyed, typed or spoken.

A means of sending a facsimile of this original copy which requires such painstaking translation would thus do away with the reorganizing and rearranging of the copy and allow the sending of information without alteration and free from secondary errors.

To be practical in business and industry, facsimile equipment must be compact, light and movable. It must be flexible enough to transmit a weather map or mobilization plan 19" wide over thousands of miles, or duplicate a bank deposit slip and signature just 2" wide within a city bank system.

A facsimile system which will satisfactorily accomplish the job of accurately and economically getting information from one point to another is the primary aim of all facsimile systems. Milton Alden and his staff of trained engineers and technicians with a well rounded knowledge of electronics, mechanics, materials and manufacturing processes have designed and built a series of facsimile machines which accomplish exactly what is required.

Early Problems

An early problem which had to be overcome before high speed facsimile could become successful was the media upon which the transmitted information was received and recorded. Developments in this field included starch iodide recording paper used extensively in sonar recording. This paper, however, had the disadvantage of fading after a short time. Dry electro-sensitive papers with conductive coatings which are burned off by a stylus with a high voltage spark, had problems of arcs, fumes and smoke making this paper far from satisfactory. Wet electro-sensitive papers were equally unsuccessful.

Alfax Paper

After considerable research Alfax paper was developed. Here was the answer to the need for an absolutely stable recording paper before and after recording. The paper can and will withstand freezing temperatures, tropical humidity, rain and rough handling.

The Alden Executive and Research Building at Westboro, Mass. Just behind this is the model plant.

Once recorded on Alfax paper the record is permanent. The recorded mark has no tendency to continue to grow; it stops instantly once the recording current stops. The recorded mark on the surface of the paper and does not extend through the fibers, thus producing superior definition. By using Alden patented techniques, the paper's sensitivity is controlled up to the time of recording and is, therefore, unaffected by outside conditions. This feature permits unattended operations of Alden recorders.

Early facsimile recorders were plagued with the problem of maintaining the correct contact between the recording paper and the recorder blade. Problems such as shredding and bounce of the recorder bar were encountered. In addition, ion deposition was added to these problems. When recording there is a slight deposition of metal ions from the marking electrode onto the paper. This ion deposition is a wearing down process which causes unevenness of the recorder electrode and its eventual replacement.

E. D. Cross (left), director of Alden facsimile, and John Alden, manager of the Brockton manufacturing operations, in the facsimile assembly room at the Brockton plant.

Moscow's Primary Target is U. S. Business

"Communist world domination," Lenin once said, "is impossible without the violent destruction of the machinery of the capitalistic state."

Lenin's eyes, even then, were on the United States. What he meant was that so long as the resources and production of America were strong the free world would remain too tough to gobble up.

Our industrial and business institutions, small and large, are the hard core of our "capitalistic state" so hateful to the Communists. Hence, the Kremlin works day and night within our borders to put us out of business. Depression within the U.S. is the eternal mission of Moscow . . .

> **By advocating ruinous taxes upon business; by infiltrating unions and fostering costly strikes; by supporting legislation to throttle fresh investment and industrial expansion; by creating frictions and distrust between business and the public.**

The Communist organs within our midst establish the platform and tell the story week by week for all to read and ponder.

The Gray Manufacturing Company believes it has an obligation to freedom, to America, and *to its own stockholders and employees,* to expose and combat the conspiracy that would destroy the foundations upon which the company stands. Among other things it uses part of its advertising budget for this purpose. *We believe it's good business.*

Gray is proud that this campaign earned the Patriotic Advertising Award of the Sons of the American Revolution. The citation reads in part:

> **"In recognition of its outstanding series of institutional advertisements dedicated to the protection of our American way of life against the threats of Communist subversion and to the preservation of liberty, justice and private initiative which has given us the highest standard of living and the greatest individual freedom this earth has ever known."**

And J. Edgar Hoover, Director of the Federal Bureau of Investigation, has commended the Gray Company as follows:

> **"American industry can render a great service in helping fight Communism. Through their advertising media, timely messages can bring home to the American people the many evils of Communism . . . I feel that your efforts in pointing out the threat of Communism are a most praiseworthy public service."**

Reprints of these public service advertisements, exposing the Communist conspiracy, are available on request. Write to: The Gray Manufacturing Company, Hartford 1, Connecticut.

DUTY HONOR COUNTRY
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AUDOGRAPH
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The GRAY Manufacturing Company, Hartford 1, Conn.

Audograph and PhonAudograph "Pushbutton Dictation" Equipment

and Gray Research & Development Co., Inc., Specialists in Video, Audio and Electro-mechanical Devices

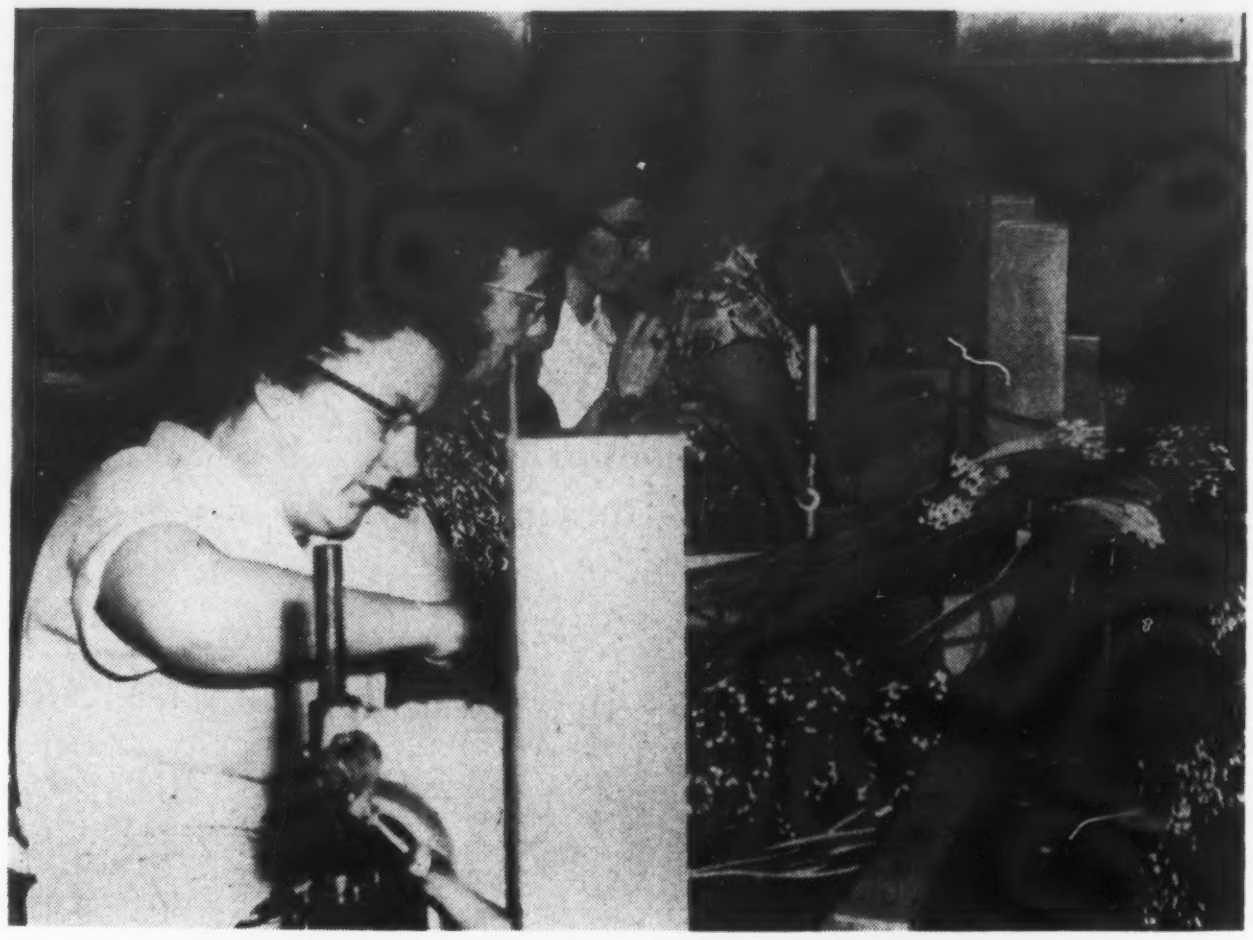
Recording Loop

Mr. Alden was able to turn this ion deposition characteristic into an advantage by developing and patenting a continuous loop electrode rather than a bar. Positioned by two fixed stops located outside of the width of the paper, this recording loop is accurately located and moves continuously or intermittently as the recorder is in operation. As the metal ions are removed the blade moves, preventing ion deposition from one spot constantly. This recording loop movement gives a self-adjusting and compensating recording electrode.

To further protect this adjusterless process, Alden developed a unique, resilient helix element. This new element was incorporated into a structure which maintains proper contact with the recording paper. The amount of pressure applied is limited to the element,. and the element cannot, therefore, cut into the paper beyond the desired depth.

Alden Electronic and Impulse Recording Equipment Company manufactures a series of facsimile recorders with printing widths of 2", 5", 8", 11" and 19". These recorders are capable of recording up to 800 words (elite type) and 1200 words (newspaper type) per minute. In a recent test, one recorder printed 15,000,000 words on a half mile of Alfax paper in 24 hours without stopping for adjustment other than to supply additional rolls of Alfax recording paper.

Today Alden facsimile equipment is being used by the United States Weather Bureau in a steadily growing network of major installations for the reception of weather maps from the Bureau's headquarters in Washington. Several schools of meterology have also tied into this network. Alden weather map equipment is now being used by the United States Army Corps of Engineers in Omaha, Neb.



View of the model Alden Systems assembly lines at Westboro.

The facsimile equipment, pictured below, turns out weather maps 18" wide and as long as you want them.

Facsimile in Business

Alden facsimile equipment in the banking field is now in daily use in Boston (Provident Institution for Savings) and Worcester (Worcester County Institute for Savings). In both cases facsimile connects the tellers to the bookkeeping and signature section. The facsimile transmission between points is accomplished by a special facsimile telephone line.

Other industrial or commercial users can make use of the multiplexing feature offered by F. M. radio stations and approved by the Federal Communications Commission. Under these circumstances the F.M. station can rent or lease a portion of its wave band without interfering with its regular transmission. The Alden high speed facsimile equipment, 81 square inches per minute, uses only 7.5 kilocycles of the band. Under these conditions the F.M. station might operate facsimile transmissions simultaneously with their regular sound program.

An important industrial variation of Alden facsimile equipment is the Alden fact finding recorder which can produce for analysis at a later date a record of individual activity. This type of recorder uses two channels plus timing to monitor occurrences.

For production control and automation, the multi-channel fact finder permits a constant check of operation of up to 30 machines per recorder. In this way it is possible to determine when and for how long a machine is out of service before maintenance or supplies of raw materials get it back into production.

Industrial Aids

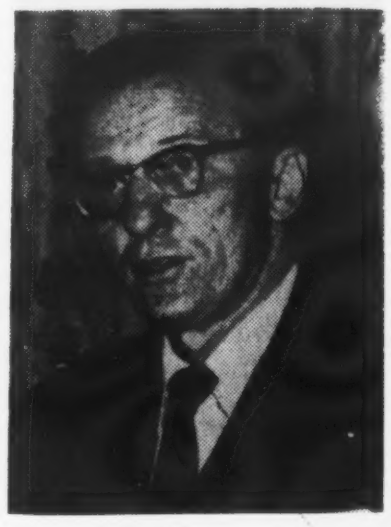
Under the guidance of the Alden family, the Alden Systems Company has produced a number of outstanding industrial production aids. Most prominent of these is the "basic work center" which is a specially designed work bench. This bench, five feet in length, is available in two types—one for assembly and manufacture and the other for laboratory work.

The interrelationship of the Alden family of enterprises, Alden Products Company, Alden Systems Company, Alfax Paper and Alden Electronic and Impulse Recording Equipment Company is an example of American research and manufacture in operation dedicated to an idea, experimentally investigating and improving upon that idea and then adjusting it to manufacturing processes which can be common everywhere.

A Brief Look at

The History of Automation

Excerpts from a talk given at the AFCEA Washington Chapter Luncheon on February 2nd. The luncheon was part of a special all-day Automation Show sponsored by the Chapter.



by Dr. Allen V. Astin
Director
National Bureau of Standards

NOWADAYS "AUTOMATION" SEEMS TO MEAN VARIOUS things to various audiences. The term has a multitude of connotations. For some it defines the broad area of technology in which machines are used to control other machines. General Electric, for example, has defined automation as "continuous automatic production" in the sense of linking together already highly mechanized operations. For others it carries the meaning of data-processing solely, that is, the introduction of machine techniques into the control of office and business management procedures. And for still others the term "automation" may be restricted to a more narrow scientific area where advanced high-speed electronic computers are used in the solution of complex technical problems. These are not serious divisions in understanding, and I think these divisions may be joined by looking back into the earlier history of automation and by noting how it derives from the broader concepts of mechanization.

The idea of automation is lodged in history. If we look hard enough, I believe we can find traces of it even before the Industrial Revolution of Western Man. For example, the ancient Romans invented a hydraulic float valve to control automatically the level of water in storage tanks. True, this example is a far cry from what we mean by modern automation, but is not the float valve a forerunner of those modern sensing devices which are so necessary to automatic control? The principle is there. This sensing device, created by man, was capable of making certain limited observations and then causing certain rigidly specified actions or processes based upon these observations.

Now such examples can be multiplied several times over, but suffice it to say that as we go along in history, such devices came to be more and more precise, taking advantage, as time went on, of the latest developments in science and technology. In modern times, mechanical sensing devices have given way to electronics with all its capabilities of high speed, sensitivity, and efficiency.

But the accumulation of all such sensing devices would not account for the development of modern automation. We must look to more recent history. About 100 to 150 years ago may be found the real pioneers of this technology. Among these are Charles Babbage, that phenomenal visionary Cambridge mathematician, J. M. Jacquard, the ingenious French weaver and mechanic, and Eli Whitney, our own talented American inventor. All of these were contemporaries. Each introduced concepts and devices which gave rise to the art of automation.

Charles Babbage, of course, is the father of the modern computer. The application of his dream lies at the very core of what we now mean by automation. His strivings against adversity are probably well known to all of you. His Difference Engine and later his Analytical Engine were never brought to fruition during his own lifetime. But his was the first digital computer. It is interesting to note that when British computer developments became active again in 1912, Babbage's drawings and designs served as the starting point. What did Babbage give to automation? First, some usable and practical ideas for developing the modern computer, but even more important a method for translating data into a form which could be digested and assimilated by machines.

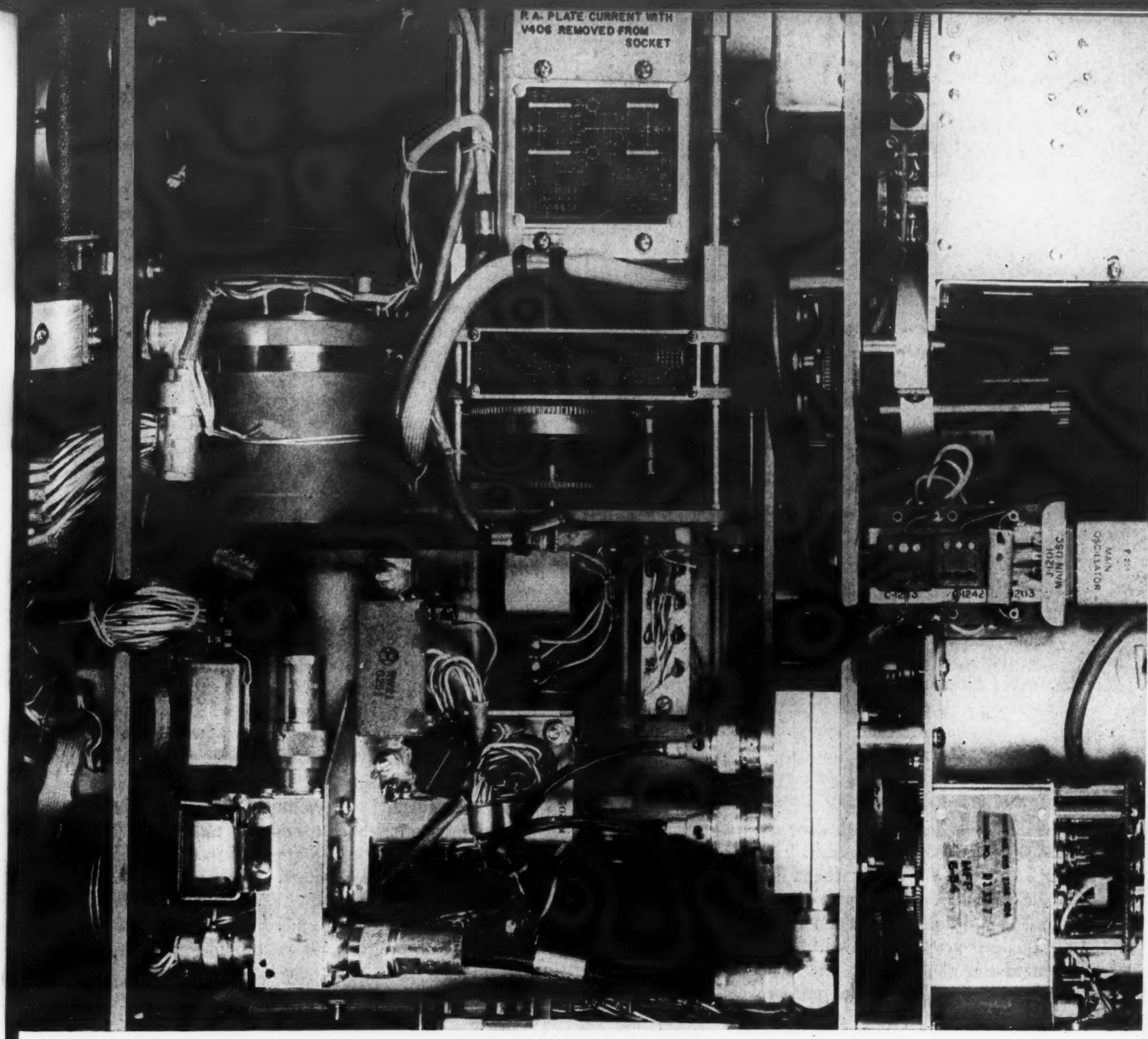
This brief acknowledgment to the magnificent contributions of Charles Babbage would indeed be insufficient were I not to mention, however briefly, that Babbage was largely responsible for the modern machine tool industry. His work on improving lathes and gear cutting tools seems to have been motivated by the idea of mass production and the fabrication of interchangeable parts so necessary to our modern economy. Thus, he contributed to both aspects of automation.

Eli Whitney, on this side of the ocean, shared Babbage's ideas about mass production, although quite independently. These ideas are probably the source of the major revolution which took place in the history of mechanization. The ideas are based upon the critical use and refinement of the techniques of physical measurement.

* * *

. . . When items are fabricated according to physical characteristics, as defined on a blueprint or specification, they can be used interchangeably. Developments along these lines led to mass production techniques, the essence of which is interchangeability of parts. Eli Whiney was

(*Continued on page* 46)



Equipment built by Delco Radio: AN/TRC 32 transportable control

AIR CONTROL...from Delco Radio

Delco Radio's outstanding record of low-cost, high-quality, on-time mass production of electronic equipment for military applications has been proved in war and in peace. With all production facilities centralized under a single roof, Delco Radio can take raw materials through to finished product for considerably less cost than ordinary assembly contractors can and still assure on-time delivery. Take advantage of Delco Radio's experienced engineering and uniquely different production facility when you need high quality units produced at lower cost.

GM GENERAL MOTORS

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KOKOMO, INDIANA

among the first to demonstrate this technique approximately 150 years ago. He showed that rifles could be assembled from interchangeable parts, each one of which was fabricated in accordance with carefully prescribed procedures of physical measurement.

In recent years, this process of manufacture is the major part of industrial production. It has been accelerated by the fact that instruments have been designed to make certain measurements automatically, as well as by instruments which can make these measurements more precisely.

I should like also to mention briefly the unique contribution of Jacquard, the French weaver. It was he who devised the principle of storing control information on a punched card. How he arrived at this principle is one of the curiosities of the science of automation. Jacquard wanted a means for reproducing certain patterns on tapestries. He hit upon the idea of punching control information on cards. The holes on these cards would, in turn, control the action of rods which guided the threads on his loom. The holes on his card, therefore, served as a storage and record unit of his patterns and also as the control for his weaving machine.

* * *

The three men whom I have selected from the early history of automation are by no means all of them. But the services of these men illustrated quite vividly that the idea of automation is not new. Machines to control machines go back into the centuries. *Furthermore, the idea of complex computational devices and their use in the control of industrial processes is more than 100 years old.*

What then has caused this intense modern interest in automation? I think it is caused by the phenomenal advances in the field of electronics which have been made in the past 30 years. Improved devices have now come into being which make it most practical to incorporate them into factory production. For instance, the development of the photoelectric cell is an excellent and most important example of a sensing tool which has opened up new avenues of automatic production. But I think more important than any of these devices is the active application of the concept of feedback, using both computational and sensing instruments.

Feedback merely means the use of the result of a physical measurement at one stage of a mechanical process to alter or control an operation at an earlier or later stage of the process. In steel production, for example, it is customary to run analyses on the composition of the melts at various stages along the processing line. A human operator may make the measurements with mechanical instruments which can result in an orally conveyed order to modify a phase of the production process, or the measurement and resulting modification could be made automatically using feedback. In modern petroleum refining, the measuring process, the order giving and the resulting control modification can all be accomplished automatically.

* * *

The concept of feedback, in its fullest sense, is still not an important part of modern production. *It seems to me, therefore, that the really great advances in industrial automation are still in the future.* They must await further advances in sensing and computing devices and the incorporation of their capabilities into industry.

I do not mean to decry the advances which have now been achieved. Certainly these have been noteworthy. *I merely wish to emphasize that it is my belief that the age of automation has not yet arrived, that its greatest period is still to come.* What we have today, and only in limited number, are advances over the conveyor belt system which has been characteristic of mass production methods for the past 50 years. The key innovation which defines these advances is the introduction of transfer mechanisms which enable us to move a product from one stage in production to the next.

Such advances, I believe, have led and will lead to improved processing and assembling techniques, but they do not yet take full advantage of the control capabilities offered by modern computers. I say this despite the fact that the National Bureau of Standards has made substantial contributions to these modern processing and assembling techniques. It is probably known by you that the Bureau's work on Project Tinkertoy for the Navy's Bureau of Aeronautics led to the design and efficient assembly of modular packaging for electronic equipment. I am proud of our achievement in this field and of the fact that this achievement has served as a model for several industrial producers. The system has given to producers a flexibility which is greater than hitherto achieved. It has offered to industry the unusual

Part of the crowd of over 600 which attended the AFCEA Washington Chapter Luncheon at which Doctor Astin spoke. The luncheon was part of the full day's program on Automation sponsored by the chapter.

possibility of standard packages for subassemblies with the attendant simplification of maintenance and repair.

Nevertheless the advances which are exemplified by Project Tinkertoy fall far short of what I think is implied by the word "automation." To achieve the fuller potential of automation, I believe it will be necessary to make more extensive use of automatic high-speed electronic computers as control devices in the production process. It will give to an assembly of machines a capacity for decision and judgment which is still unavailable to industry. By building into the production process techniques which can critically examine and compare results all along the production line and which can alter production automatically based upon these results, industry will have at its disposal the full advantage and flexibility offered by automation. When this possibility is fully exploited, we will have a range and variety of production which is even breathtaking in its promise. The realization of this promise, of course, is still somewhat in the future.

It is to the computer as a flexible control mechanism that we must look for future developments. Further advances in computer technology are needed. Engineers are needed in this field who will look for ways to apply this technology to production. The computer is characteristically different as a control mechanism. With modern computers, man has at last created an instrument through which he can delegate certain limited powers of judgment and decision. Of course I do not mean that the computer is capable of thinking per se. What I do mean is that man has now devised a scheme by which he can effectively store the criteria for certain decisions and thereby specify the electronic paths and electronic alternatives which the machine must take based upon data resulting from examination and comparison. And all this can be done at high speeds. This, I think, offers the greatest promise for automation. This is what characterizes automation as a most unique part of mechanization and what makes automation a comparatively young part of our history.

* * *

Today, there are faster and more capable computers in operation or in the design stage. Both the analog and the digital computer show great promise as control mechanisms. This is especially true when such computers are used in combination, in which advantage is taken of the capabilities of both devices. The use of both types of computers in tandem for production control is of current interest to scientists and engineers. Application to industry is still somewhat in the future.

* * *

I should like next to mention a peculiar anomaly in the history of automation. *It may seem paradoxical that the electronics industry which has been responsible for most of the major advances in automation is among the last to seek automation.* The reasons for this are not hard to find. First of all, the industry is comparatively young. It is only some 30 years old, and in that time it has grown into a 5 billion dollar a year industry. Changes in the industry came so fast and the demand upon it so

AFCEA members and guests view exhibits at the Washington Chapter Automation Show. Exhibitors were: ACF Electronics; Admiral; Aerovox, General Electric; General Mills, Melpar; RCA; Stromberg-Carlson; Sylvania, and United Shoe Machinery.

large that it had very little opportunity to sit back and look at its own production methods. Second, the nature of the electronic equipment industry was such that it did not require large capital investment. Thus, large tooling and machines were not required for production. And finally, the nature of the instruments which were produced, up until recently, required hand operation during assembly.

Now the electronics industry is making rapid strides towards mechanization as can be seen from the many interesting exhibits collected for this AFCEA Automation Exposition. The primary impetus towards this change is the development of techniques for mass producing components. This is due to an appreciable extent to the advances which have been made in printed circuitry and in the creation of modular building blocks. In both of these developments, I think, the National Bureau of Standards has made contributions. I have already mentioned our work on Project Tinkertoy. I should like also to mention that we are active in developing standards for electronic circuitry and in making available to the electronics industry information on preferred circuits which can be used in a variety of electronics equipment. Although these Bureau contributions may be important, the trend towards mechanization in electronics, I believe, comes from a conscious effort in the industry itself, from a realization that it must look to such methods for greater economies and for a means for keeping up with the growing demand placed upon it.

Now I should like to sum up this brief historical view of automation. Automation is not new. It comes naturally from scientific research and development in the field of mechanization. It is new only in the sense that major recent advances in the field of electronics and communication can now be applied to mechanization. It is new in the sense that phenomenal advances in sensing and computing devices now offer great promise for the logical and flexible control of machines of production. I think in its fullest sense that automation implies the use of high-speed electronic data-processing and computing devices. These new devices promise to add effective tools which can be introduced into industrial production.

Stretching the Path of an Electronic Pulse

Military coding equipment takes one pulse and inserts it into a delay line and in effect sends it over a number of paths, each of different lengths. Combining the output of the paths gives a pulse train with pulses spaced in accordance with artificial length of the path. Ordinarily the flexibility of the equipment is limited by the fixed taps in the delay line and the accuracy is established by auxiliary circuitry.

Now Admiral research has developed a completely new type of delay line which is infinitely variable within its over-all capacity. It is adjustable with the greatest facility for any desired interval. The accuracy of this line is limited only by the accuracy of the measuring equipment. Moreover, the Admiral delay line requires less complicated switching apparatus. Weight and bulk are reduced. Fewer components permit faster production at lower cost. Here is one more example of Admiral's capabilities in the field of military electronics. Address inquiries to:

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Association Affairs

Companies Accepted for AFCEA Group Membership Since January 1, 1956

The British Thomson-Houston Co., Ltd.
Rugby, England
Haller, Raymond and Brown, Inc.
State College, Pennsylvania
Lenkurt Electric Company
San Carlos, California
North American Philips Co., Inc.
New York, New York
Tensolite Insulated Wire Co., Inc.
Tarrytown, New York
T.M.C. (Canada) Limited
Ottawa, Ontario
***Wheelock Signals, Inc.**
Long Branch, New Jersey

Brief notes about these companies will appear in the May-June issue.
***Brief notes about this company appear on page 50.**

564 new AFCEA individual members from Jan. 1 to March 1

New AFCEA Chapters

Central Florida

Chartered in February, the Central Florida Chapter has its headquarters at Tampa, Florida.

Willard L. Moor, Director, Electronics Program, University of Tampa, organized the chapter and is serving as temporary president pending formal elections. The other acting officers are: vice-president — T. H. Landgraf, Peninsular Telephone Company; secretary-treasurer — Lt. Col. Russell R. Randell, AUS(Ret.).

Formal presentation of the chapter charter was made on February 9th by Col. George P. Dixon, Executive Vice President, at a meeting at the Officers Club, MacDill Air Force Base.

Korean

Another overseas chapter was added to our rolls on January 1st when petition for charter was received and approved at national headquarters. Headquarters of the chapter are at Seoul.

Officers have been elected as follows: president — Col. Willice E. Groves, Signal Officer, 8th Army; vice-presidents—Arthur Feilen, Philco Corp.; Maj. B. B. Jackson, K.M.A.G.; Col. William H. Gaeckle, Senior Signal Advisor, K.M.A.G.; secretary-treasurer—Maj. Robert G. Morgan, Hqs. AFFE/8th Army.

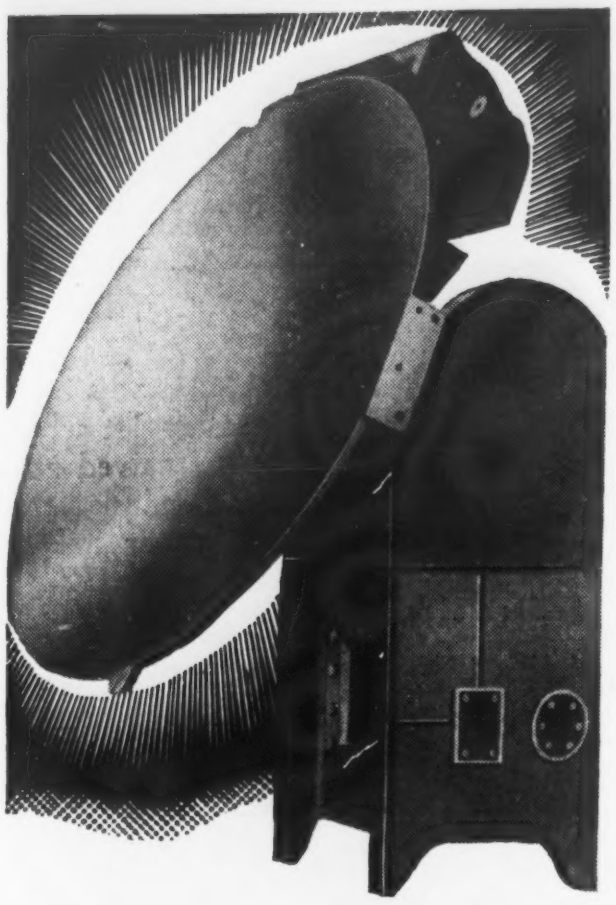
Introducing AFCEA's New Group Members

American Tel. & Tel. Co. Long Lines Dept.

The Long Lines Department of the American Telephone and Telegraph Co., New York, N. Y., became a group member of the AFCEA in December.

Serving as company representatives in the Association will be: H. T. Killingsworth, vice president; H. M. Botkin, assistant to vice president; R. W. Miller, assistant vice president; W. G. Thompson, assistant vice president; R. L. Helmreich, director of operations; V. B. Bagnall, assistant director, operations-engineering; F. A. Cowan, assistant director, operations; G. D. Montgomery, military communications manager; J. W. Heinrich, commercial supervisor, military communications, and C. W. Wideberg, general manager, Eastern area.

Some of the officers and members of the newly formed Korean Chapter. Seated, left to right: Arthur E. Feilen, 2nd vice pres.; Col. William H. Gaeckle, 1st vice pres.; Maj. Burwell B. Jackson, 3rd vice pres. Standing, left to right: Col. Francis J. Brophy, Capt. Albert C. McLand, Col. Clarence Reiser, Lowell K. Cheney, Capt. Robert Wright, Lt. Col. James Mayall, Col. Ralph W. White and Lt. Col. Melvin L. Maxson.



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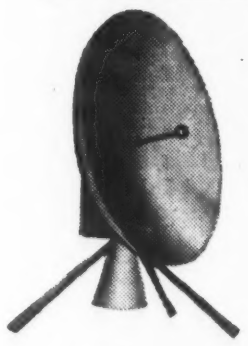

FROM DRAWING BOARD
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ASSOCIATION AFFAIRS

Burroughs Corp.

Another new group member in December was the Burroughs Corporation of Detroit, Michigan, manufacturers of computation machines.

The following will be company representatives in the Association: P. S. Mirabito, general manager, defense contracts; H. B. Rottiers, director, defense contracts; J. C. Lindley, sales manager, defense contracts; M. R. Capo, administrator, defense contracts; W. R. Turner, military field service manager, and R. L. Lancaster, R. J. Egger, C. B. Mansky, J. D. Clair, C. T. Jardine, district defense sales managers.

Convair, division of General Dynamics Corp.

CONVAIR, a Division of General Dynamics Corporation, Pomona, Calif., joined the AFCEA in December.

Serving as company representatives under this membership are: RAdm. C. F. Horne, USN (Ret.), division manager; C. D. Perrine, assistant division manager, engineering; C. R. Irvine, assistant to vice president, engineering; G. M. Robertson, chief engineer; G. E. Sylvester, chief design engineer; J. L. Bowers, staff engineer, and P. Ferrara, W. S. Ivans, W. H. Crow and A. E. Salis, engineers.

Fairchild Camera and Instrument Corp.

The Fairchild Camera and Instrument Corporation, Syosset, New York, became an AFCEA group member in December.

Company represenatives in the Association wil be: J. H. Clough, president; J. M. Case, executive vice president; Richard Hodgson, vice president; C. Towner French, marketing manager; Raymond G. Hennessey, sales engineering manager; Lowell J. Hartley, engineering department manager; M. Chaffee, director, electronics and systems research; I. W. Doyle, manager, systems development projects; T. E. Blount, manager, Washington office, and H. A. Meade, manager, Dayton office.

Hycon Eastern, Inc.

Hycon Eastern, Inc., an electronics firm with offices in Cambridge, Massachusetts, became a group member in December.

Members representing the company in the Association are: Malcolm M. Hubbard, president; Alfred J. Pote, chief engineer and vice president; Oliver H. Straus, vice president and assistant treasurer; Michael A. Wall, business manager, and John E. DeTurk, Gerald J. Adams, Richard L. Smith, George M. Hamm, John F.. Moore, and Jackson H. Cook, engineers.

Wheelock Signals, Inc.

Another company to become a recent group member of the Association is Wheelock Signals, Inc., formerly Signal Engineering and Manufacturing Company, located in Long Branch, N. J.

The officials included in this membership are: R. D. Wheelock, president; R. D. Bean, vice president; C. R. Durling, Jr., sales manager; J. E. Gould, purchasing agent; L. G. Libutti, controller; H. J. Sundermever, sales engineer; F. A. McKenna, chief laboratory engineer, and J. E. Yunker, production engineer.

Presentation of the Central Florida Chapter charter took place on February 9th. Taking part in the ceremony are, left to right: AFCEA Executive Vice President George P. Dixon; T. H. Landgraf, chapter vice president; Willard L. Moor, president; and Russell R. Randell, secretary-treasurer.

IN THE PALM OF HIS HAND

. . . a complete military transmitting and receiving station weighing about one pound!

The "battle maneuvers" illustrated above disclose a new dimension in military communication, made possible by modern transistor developments.

In his hand the officer holds an RCA Transceiver, a complete radio transmitting and receiving unit—the smallest 2-way FM radio ever built. The entire walkie-talkie is only 6" x 3" x 1⅛" in size, with weight, including battery and all accessories, of about 20 ounces.

The men in the field listen to "battle instructions" over tiny receiver units built inside their helmets.

With a range of about a quarter mile, the RCA Transceiver can be pre-set for any frequency between 45 and 52 mcs. Only two controls are used and no tuning or adjustment is necessary during normal use. The receiver is an all-transistorized superheterodyne and the transmitter comprises two transistors and one tube, both contained in a single unit.

The feather-lightness and miniature size of the transceiver and receiver make it possible, for the first time, to extend communication to the individual level. It is another instance of RCA's constant search for new and better ways of doing things electronically. Demonstration and consultation with RCA field engineers throughout the world are invited. Call or write.

RCA Ultra-Miniature FM Transceiver compared with AN/PRC-10 (Walkie-Talkie)

TYPICAL MILITARY APPLICATIONS

- Tactical communications between squad and platoon leaders and higher, also with individual soldier or marine
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Listed below are the firms who are group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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American Cable & Radio Corp.
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American Institute of Electrical Engineers
American Machine & Foundry Co.
American Phenolic Corporation
American Radio Relay League
American Telephone & Telegraph Co.
American Telephone & Telegraph Co., Long Lines Dept.
Ampex Corporation
Anaconda Wire & Cable Company
A. R. F. Products, Inc.
Argus Cameras, Inc.
Arnold Engineering Company
Atlas Precision Products Co.
Audio Products Corporation
Automatic Electric Company
Automatic Electric Sales Corp.
Automatic Telephone & Electric Co., Ltd.
Barker & Williamson, Inc.
Barry Controls, Inc.
Bell Telephone Company of Pa.
Bell Telephone Laboratories, Inc.
Bendix Radio
Berkshire Transformer Corp.
Blackburn Electronic Corp.
Bliley Electric Company
Bomac Laboratories, Inc.
*British Thomson-Houston Co., Ltd.
Bruno-New York Industries Corp.
Burroughs Corp.
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capitol Radio Engineering Inst., Inc.
Cargo Packers Inc.
Carolina Telephone & Telegraph Co.
Central Technical Institute
Chesapeake & Potomac Tel. Co.
Cincinnati & Suburban Bell Tel. Co.
Clevite Transistor Products, Division of Clevite Corp.
Coastal Publications Corp.
Collins Radio Company
Contraves Italiana
Control Engineering Corp.
Convair, Division of General Dynamics Corp.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Craig Systems, Inc.
Crosley Division-Avco Mfg. Corp.
Dana, P. A., Inc.
Designers for Industry Inc.
DeVry Technical Institute
Diamond State Telephone Co.
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Downing Crystal Company
Dukane Corporation
DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
Electro Tec Corporation
Elgin Metalformers Corporation
Espey Manufacturing Co., Inc.
Fairchild Camera & Instrument Corp.
Farnsworth Electronics Company
Federal Telecommunication Laboratories
Federal Telephone & Radio Co.
General Aniline & Film Corp.
General Cable Corporation
General Communications Co.
General Electric Company
General Telephone Corp.
Gilfillan Bros., Co.
Globe Wireless, Ltd.
Grav Manufacturing Co.
*Haller, Raymond and Brown, Inc.
Hallicrafters Company, The
Haloid Company
Hammarlund Manufacturing Co., The
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motor Corp.
Hitemp Wires, Inc.
Hoffman Laboratories, Inc.
Holtzer-Cabot Division, National Pneumatic Co., Inc.
Hoover Electronics Company
Hopkins Engineering Co.
Hughes Aircraft Company
Hycon Eastern, Inc.
Illinois Bell Telephone Co.
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Industrial Development Engineering Associates, Inc.
Institute of Radio Engineers
International Business Machines
International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
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Kellogg Switchboard & Supply Co.
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Southwestern Bell Telephone Co.
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Stanford Research Institute
Stelma, Incorporated
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*T.M.C. (Canada) Ltd.
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Tung-Sol Electric, Inc.
United Telephone Co.
United Transformer Co.
Wac Engineering Co.
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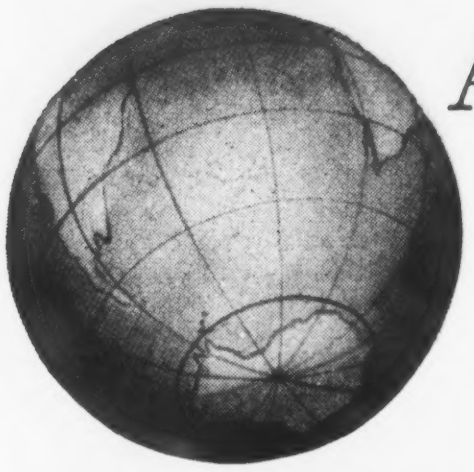
West Coast Telephone Co.
Western Electric Company, Inc.
Western Union Telegraph Co.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
*Wheelock Signals, Inc.
Whitney Blake Co.
Wickes Engineering & Construction Co.
Wilcox Electric Co., Inc.
Willard Storage Battery Company
Wisconsin Telephone Company
Wollensak Optical Company
Yale & Towne Manufacturing Co., The, Powdered Metal Products Division
Zenith Radio Corporation

*Company accepted for AFCEA Group Membership since the last issue of SIGNAL.



Another Antarctic Expedition calls on COLLINS for communication

U.S. Navy Task Force 43 is establishing several bases in Antarctica in conjunction with the International Geophysical Year activities. Two bases will be built next year, one of them at the South Pole. The expedition, appropriately entitled "Operation Deepfreeze," is under the direction of Rear Admiral Richard E. Byrd and commanded by Rear Admiral George Dufek. For radio contact between bases and the outside world, the commercial and amateur communication equipment will be Collins.

The name Collins has figured prominently in polar expeditions since 1925. During Admiral Byrd's expedition of the early 30's, Collins transmitters were used in the first Arctic/Antarctic communication link—from the Byrd Expedition (Antarctic) to a CBS station in Northern Alaska. The Collins equipment is specially packaged for air drop and long sledge journeys. Superior performance and reliability, proven time and again, make Collins the logical choice when the need for radio communication is vital.

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National Headquarters Chapters Secretary—Julia B. Godfrey

"TERRIERS"
-ready for action!

U.S.S. Boston, the Navy's first guided-missile ship with its "Terriers" ready for action, as it was commissioned at the Philadelphia Navy Yard.

ONE OF THE MOST potent defense weapons now in use by our Navy is a supersonic, rocket-propelled, guided-missile called the "Terrier". Well named, the job of this electronically-controlled "watchdog" is to track down an enemy and put him out of action *before* he can strike.

Working in close cooperation with the Armed Services on this guided-missile, Philco research, engineering and production have made important contributions to its development. This has been particularly true in connection with the proximity fuse, the mechanism which extends the effective target range and enables the "Terrier" to demolish an aircraft the moment it gets in the *vicinity* of the marauder.

From the first sketch to the final, super-accurate mechanism, Philco pioneered and completed this assignment in cooperation with the Navy. Philco's world famous scientific knowledge and skill is a continuing factor in the development of tomorrow's defense for your protection . . . tomorrow's quality products for better peacetime living throughout the world.

PHILCO CORPORATION

Chapter News

Chapter of the Year—South Texas

Atlanta

Brig. Gen. William L. Bayer, commanding general of the Signal Corps Supply Agency, Philadelphia, was the principal speaker at the December dinner-meeting at Fort McPherson's Officers Club. The subject of his talk was "Application of Business Principles to Army Signal Supply."

During the evening, an AFCEA gold lapel button was presented to W. Kelly Mosley. In making the presentation, Col. A. R. Morley, chapter president, said the chapter wished to express its appreciation to Mr. Mosley for his active and loyal service as a member and as president for the past two years.

Guest speaker at the chapter's January 18th meeting, also held at Fort McPherson, was Brig. Gen. James Dreyfus, Chief of the Procurement and Distribution Division, OCSigO.

Mr. Rahner showed a film which depicted the development of the first atomic power plant whose power was used to electrify an entire city. The city was Arco, Idaho, which is now known as the Atomic City.

Baltimore

In lieu of its regular monthly meeting, the chapter held a dinner-dance at the Officers Club, Fort George G. Meade, on December 10th. Col. J. Lindsey, commanding officer of the post, was guest of honor.

One hundred and fifty members and guests were present.

The Glenn L. Martin Company arranged the program for the chapter's January 24th dinner-meeting at Friendship International Airport, with R. J. Henderson, Chief Engineer, Electronic Equipment Section, Glenn L. Martin Company, as the main speaker.

Mr. Owen also discussed training of skin divers, skin diving problems and dangers, and the limitations of skin diving together with its advantages in underwater studies.

On display were various pieces of skin diving equipment and a $3,000 underwater movie camera, together with flash cameras.

Held at the Boston Naval Shipyard, the dinner-meeting was attended by seventy-five members and guests. Among those present was Capt. James F. Benson, USN, commanding officer, Office of Naval Research, Boston branch.

Chicago

The chapter met at the De Vry Technical Institute on December 1st with William C. De Vry, President of the Institute and a former president of the chapter, acting as host and master of ceremonies.

Atlanta. Members of the Signal Supply Section, Atlanta General Depot attending the January 18th meeting at Fort McPherson. Front row (l/r): W. A. Thompson, R. B. McKissick, E. Harris, Lt. Col. G. C. Steinbach, R. J. Smith, CWO R. Cleaver; second row (l/r): J. Morris, C. Martin, W. Mitcham, W. Taylor, N. I. Tyus, J. P. Campbell, Capt. A. Kron and Capt. R. Dalton.

Augusta-Camp Gordon

The chapter honored the ladies with a buffet dinner party on December 8th at the Camp Gordon Officers Open Mess. Sixty-four members and guests were present for the occasion. Master of ceremonies was W. O. McDowell. 1954 president.

Following dinner, Chapter President Otto T. Saar formally turned the meeting over to J. C. Woodward, Jr., the new president, for the installation of new officers. Mr. McDowell expressed the chapter's appreciation for the able manner in which the outgoing officers had guided the chapter's activities during 1955.

Door prizes were awarded, and dancing and entertainment took place at the conclusion of the meeting.

The January 26th meeting featured a lecture-demonstration by Harry B. Rahner, Chief, Reactors Branch, Savannah River Operations Office, on electrical power developed from atomic energy. At the conclusion of his talk, The program also included the sound and color film "Look to the Sea."

Boston

David Owen, research associate and specialist in underwater photography, Woods Hole Oceanographic Institution, spoke on "Experiences in Underwater Photography" at the January 26th meeting. Mr. Owen was introduced to the gathering by RAdm. E. H. Smith, USCG (Ret.), Director of Woods Hole Oceanographic Institution.

Color slide films taken from aboard the Woods Hole Oceanographic Institution fleet, which included slides of the ocean bottom, were shown by Mr. Owen to illustrate his talk. Also shown were 900 feet of color underwater movies including a ride underwater on a fishing net being towed by a trawler at three knots per hour, diving at the site of a Texas Tower, and free ascent from a 100 foot depth in the training tank at the Submarine Training School, New London, Connecticut.

Principal speaker was O. I. Thompson, Director of Education of the Institute, whose topic was "Automation Electronics—How It Affects the De Vry Curricula."

After the meeting, the De Vry organization arranged a score of interesting demonstrations as well as a tour of the school.

The Teletype Corporation was host to the chapter on January 26th. Company officials addressing the meeting were: President J. J. O'Brien, and Vice Presidents W. H. Pagenkopf, M. T. Gretz and W. J. Zenner.

Details of the meeting had not been reported as SIGNAL went to press.

Dayton-Wright

A cocktail party marked the holiday season for the chapter. Held at the Biltmore Hotel on December 20th, the affair was attended by 147 members and guests.

Boston and

Washington

Calling

AUGUSTA-CAMP GORDON
ARIZONA
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CHICAGO
GENEVA
GREATER DETROIT
GULF COAST
FORT MONMOUTH
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ROCHESTER
SACRAMENTO
SCOTT-ST. LOUIS
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SEATTLE
SOUTHERN CALIFORNIA
SOUTH CAROLINA
N FRANCISO
SOUTH TEXAS
SOUTHERN VIRGINIA
STUDENT CHAPTERS
SOUTHERN CONNECTICUT
TINKER-OKLAHOMA CITY
TOKYO

WHEREVER YOUR POST—YOU ARE NEEDED IN BOSTON, 24-26 MAY, TO E A "PARTNER IN PROGRESS" IN THE MILITARY-INDUSTRY TEAM AT THE:—

AFCEA

NATIONAL CONVENTION and EXHIBIT

May we suggest that you plan your time and travel allotment, and those of subordinates, to attend this important event. Description of the Convention, its speakers and panel leaders will be found in the Convention Issue of SIGNAL. Or, write to AFCEA Headquarters, 1624 Eye St., N. W., Washington 6, D. C., or Host Chapter Convention Chairman, Capt. David Hull, USN (Ret.), Foundry Ave., Waltham 54, Mass.

ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION

CHAPTER NEWS

A guitarist played Christmas carols, old tunes or jive—upon request. Dozens of beautiful gifts were given out as door prizes—many of them donated by members of industry. Sixteen new members were added to the rolls during the meeting.

Fort Monmouth

The chapter's December 15th meeting was a social one for the members, their families and friends. Organ music by Thomas R. Schlitz, membership committee chairman, added to the enjoyment of the evening, with everyone singing Christmas carols.

The RCA color film, "Ships that See in the Night," the story of navigational radar, was an added feature at the first 1956 dinner-meeting held on January 19th at Gibbs Hall Officers Club. Lester Scheier, technical representative of RCA to The Signal School, showed the film.

Maj. Gen. Victor A. Conrad, commanding general, Fort Monmouth, gave a short talk on the growth of the AFCEA in the past ten years and the future goal of the organization. President Fred J. Elser announced that the chapter will observe its tenth anniversary in August and that it hopes to roll up a 1,000-member roster by that time.

Dancing was enjoyed after the meeting, and the door prize was won by Gerald Kaplin, senior instructor, Radar Division, Department of Specialist Training, The Signal School. Some two hundred members and guests were present.

Kansas City

Paul H. Stoddard, Assistant Special Agent in Charge, Kansas City Office, Federal Bureau of Investigation, was guest speaker at the chapter dinner meeting on January 31st. His subject was the role played by the FBI in security enforcement in peace and war.

London

The Hurlingham Club was the scene of the chapter's annual dinner-dance on December 1st. One hundred and seven members and guests were present despite a heavy fog which delayed the arrival of a number of people and prevented many others from attending.

A reception with music was followed by dinner. President Sam Thomas welcomed the ladies and guests present and then introduced the chapter's distinguished guests. They were Maj. Gen. G. H. H. Vulliamy, present Colonel Commandant of Royal Corps of Signals and honorary life member of the Association; and Maj. Gen. L. de M. Thuillier, OBE, ADC, Deputy Chief Signal Officer, Royal Signals.

During the dance intermission, George Braund, a popular London conjurer, entertained the gathering with some excellent feats of magic.

Louisiana

Dr. Joseph C. Morris, head of the Physics Department, Tulane University, and vice president of the chapter, reported on his experiences at the Geneva Conference on peaceful uses of atomic energy at the chapter's January 23rd dinner-meeting.

The meeting was held at the Commissioned Officers Mess, Coast Guard Station, and was preceded by a social hour.

Montgomery Area

Col. Robert M. Griffin, Deputy Chief of Staff, Communications-Electronics, Air Command and Staff College, gave a detailed report on C-E activitives of Project Sagebrush at the chapter's December 18th meeting.

Annual elections were held with the following result: president—Lt. Col. Lee M. Paschall, CEI Branch, Air Command & Staff College; first vice-president—Luther Hall, base communications office, Maxwell Air Force Base; second vice president—Fitz Hugh Lee, Southern Bell Telephone and Telegraph Co.; secretary-treasurer—Irvin Gassenheimer, Jr., Mercantile Paper Co.

New York

RAdm. Stanley F. Patten, USN (Ret.), vice president of Allen B. DuMont Laboratories, Inc., was elected president of the chapter at its annual elections on December 14th.

Other officers chosen for 1956 are: vice-presidents—Col. Benjamin H. Oliver, Jr., American Telephone and Telegraph Company; Henry R. Bang, New York Telephone Company; and Col Ludwig R. Engler, RCA Communications; secretary—David Talley, Federal Telephone and Radio Company; treasurer—Theodore N. Pope, Bell Telephone Laboratories; recording secretary—Royal F. Jewett, Western Electric Company.

Board of Directors: VAdm. Walter S. Anderson, USN (Ret.); George W. Bailey, Institute of Radio Engineers; Col. Theodore L. Bartlett, Radio Corporation of America; Thomas Brown, New York Telephone Company; Edwin C. Carlson, Mutual Life Insurance Company; RAdm. Roy W. M. Graham, Raytheon Manufacturing Company; Lt. Col. W. L. Hallahan, Laird & Company; J. V. L. Hogan, Hogan Laboratories; Frederick R. Lack, Western Electric Company, Inc.; Maj. Gen. Francis H. Lanahan, Federal Electric Corporation; Donald F. McClure, New York Telephone Company; Col. Julian Z. Millar, Western Union Telegraph Co.; Col. Thompson H. Mitchell, RCA Communciations, Inc.; L. F. Spangenberg, Mackay Radio and Telegraph Company; RAdm. Ellery W. Stone, American Cable and Radio Corporation, and Col. Allen E. Wharton, New Jersey Bell Telephone Company, retiring chapter president.

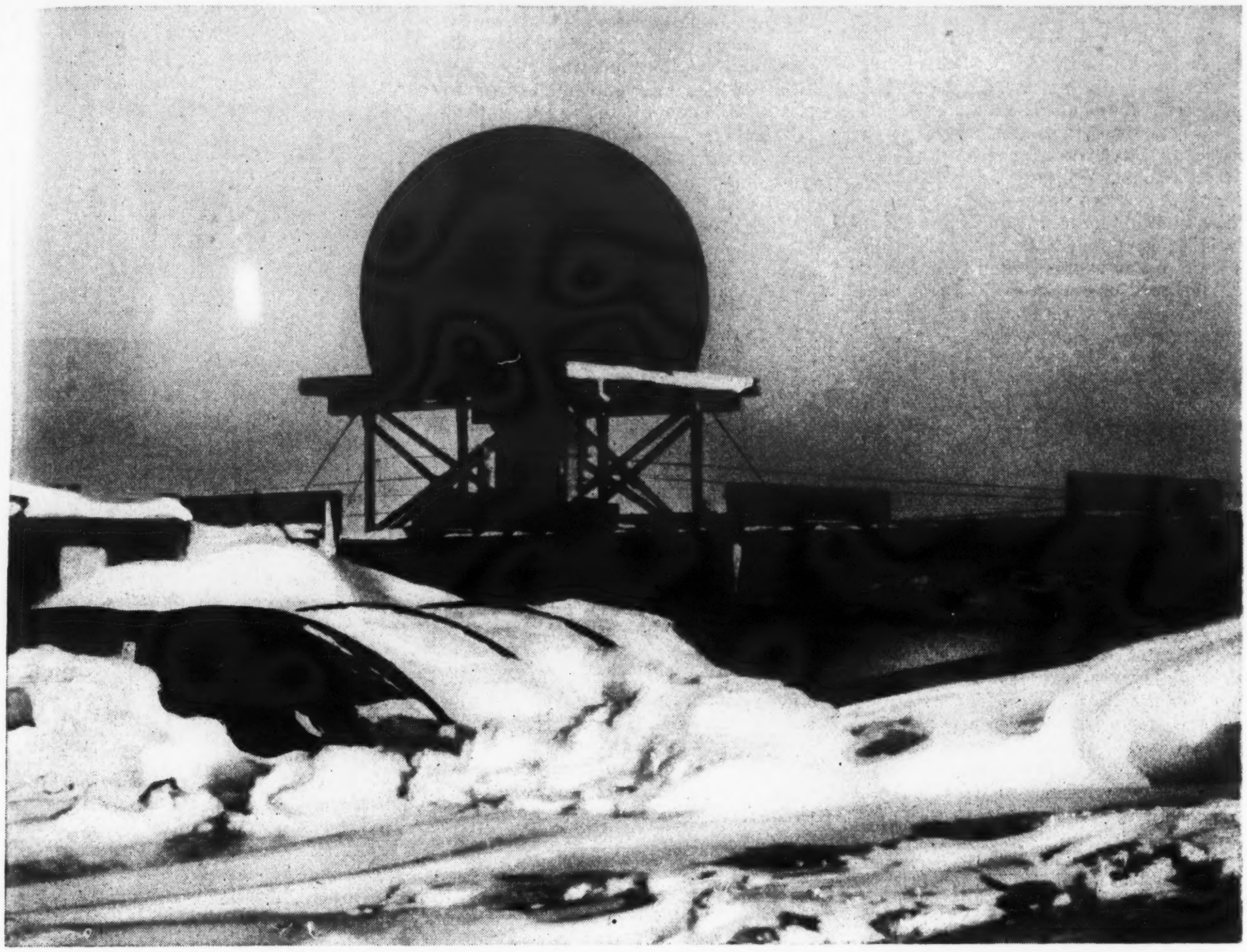
Committees have been appointed as follows: Armed Forces—Col. Charles B. Brown, Signal Officer, Hq. First Army, chairman; Capt. E. R. Winterhaler, Eastern Sea Frontier; Col. Nelson S. Brooks, Eastern Air Defense Force, and Col. Arthur A. McGrary, Signal Corps Pictorial Center. Financial—Lt. Col. W. L. Hallahan, chairman; public relations—Edwin C. Carlson, chairman; liaison—George W. Bailey, chairman; meetings—Thomas Brown, chairman; membership—Louis J. Malnati, Western Union Telegraph Company, chairman, and reserve affairs—Col. Donald A. Bolger, Mitchel Air Force Base, chairman.

By a rising vote, the chapter expressed its appreciation and thanks to all the outgoing officers, directors and standing committees who did so much to further the progress of the New York Chapter during 1955.

The evening's program consisted of a series of three motion pictures from the National Broadcasting Company. Two of these films, entitled "The In-

Fort Monmouth. Portion of the head table at the chapter's January 19th dinner-meeting and dance. Left to right: Maj. Gen. Victor A. Conrad, C.G., Fort Monmouth; Mrs. Lester Scheier; Col. Fred Elser, chapter president; Lester Scheier, RCA; Mrs. William Christopher; and Col. John C. Monahan, Fort Monmouth Chief of Staff.

TELEPHONE TECHNOLOGY AND NATIONAL DEFENSE



Here in the Arctic wasteland—some three hundred miles north of the Arctic Circle—is a specially equipped radar station.

It's part of the Distant Early Warning (DEW) Line—an electronic "fence" now being built inside the Arctic Circle to give North America advance warning of invader aircraft.

Eyes on top of the world

The monumental task of designing and producing the new electronic equipment needed, training personnel, supplying everything from food to fuel and getting it all there over thousands of miles of frozen wasteland is a joint endeavor of U. S. military services and of industry.

The DEW Line project is headed up by Western Electric as prime contractor operating a team of communications specialists selected from our own ranks; from 17 Bell Telephone Companies, Bell Telephone Laboratories, A.T.&T.'s Long Lines Department and our Canadian affiliate, Northern Electric Company. Hundreds of subcontractors, too, are assisting.

DEW Line is a splendid example of team action on a grand scale. It is, moreover, a good example of the way in which telephone technology is being applied to the national defense.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

side Story of Television" and "Illusions Unlimited," described the behind-the-scenes story of producing a television program. They depicted the many hundreds of items that are necessary to make up a television program and the great amount of preparation required for weeks before the presentation. The third film told an interesting story about training horses in Scotland for use on TV programs in the United States.

The story of TACAN was the theme of the January 18th meeting at the Belmont Plaza Hotel. The speaker of the evening was Henri Busignies, Executive Vice President, Federal Telecommunication Laboratories, who discussed the recently declassified tactical air navigation system which was developed for the United States Navy and Air Force by Federal Telecommunication Laboratories and manufactured by Federal Telephone and Radio Company .

Mr. Busignies traced the early development history of TACAN prior to World War II. He told how the development of the Instrument Landing System, together with radar techniques during the past war, was the forerunner of the TACAN system. He described by means of illustrated charts the principles of TACAN, and showed how it provides very accurate radio azimuth and distance services to both carrier- and land-based aircraft by means of electronic equipment incorporating many advanced design features. The present TACAN system, Mr. Busignies stated, has a range of over 200 miles and provides bearing accuracies within .2 of a mile and has a capacity of 126 channels—that is, 126 individual airplanes can simultaneously check their bearing and distance from the ground-or ship-based equipment.

A series of colored slides were shown of TACAN installations in Alaska. These depicted the AN/URN-3 ground beacon equipment and antenna as installed at the various air fields in Alaska. The airborne unit, AN/ARN-21 equipment, and other equipment items were displayed for the inspection of members and their guests after the meeting. In addition, copies of the booklet, "Principles and Features of TACAN" were distributed.

North Carolina

The chapter's first regular meeting since its organization was held on February 2nd, with thirty-two members present. Lt. Col. Don C. Benjamin, temporary president, presided. The invocation was given by Chaplain Albert W. Nickel.

A brief talk on the background and aims and purposes of the Association was given by Col. Henry J. Hort, Signal Officer, 1st Logistical Command, founder of the chapter. Later in the evening, Colonel Hort was named honorary president.

New York. Henri Busignies, Executive Vice President of Federal Telecommunication Laboratories, addresses the January meeting on the subject of TACAN, the recently declassified tactical air navigation system developed for the Armed Forces by FTL.

Elections of permanent officers were held, with the following chosen to head the chapter during its first year of activity: president—Col. Charles A. Stanley, XVIII Airborne Corps; 1st vice president—Luke W. Hill, president, Carolina Telephone & Telegraph Co., Tarboro; 2nd vice president—Joe S. Stone, general manager, Southern Bell Telephone & Telegraph Co., Charlotte; secretary—Capt. Russell G. Watts, Signal Section, 1st Logistical Command, Fort Bragg; treasurer—Theodore P. Williamson, commercial manager, Carolina Telephone & Telegraph Co., Fayetteville.

Committees were appointed as follows: membership—C. L. Lott, Southern Bell T&T Co., chairman; J. E. Johnston, AT&T Co.; C. T. Lawrence, Carolina T&T Co.; Col. Henry J. Hort, and Maj. F. I. Holden, 50th Sig. Bn., Fort Bragg; program—J. R. Fowler, Carolina T&T Co., chairman; J. B. Teal, Carolina T&T Co.; Maj. W. S. Bell, Psywar Center, Fort Bragg; Maj. F. G. Sheviak, CONARC Board No. 5, Fort Bragg; Maj. W. V. Horne, 82nd Abn. Div.; finance—Col. W. A. Simpson, CONARC Board No. 5, chairman; J. K. Avent, Carolina T&T Co., and W. E. Forehand, AT&T Co.

Northwest Florida

The chapter's first annual meeting took place at Eglin Air Force Base on February 2nd with election of officers the main item of business.

Lt. Col. Walter G. Wilson, Hq. AFOTC, was chosen to head the chapter. The other new officers are: 1st vice president—Lt. Col. Blair D. Baylor, Hq. AFOTC; 2nd vice president—George C. Fleming, APGC; secretary—Capt. Ross E. Tillman, Jr., APGC; treasurer—Maj. Stanford M. Ingram, Hq. APGC.

A general discussion of chapter affairs followed the installation of officers and plans were made for future activities.

ENGINEERS
Electronic Mechanical

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- Subminiaturization
- Electro-Mechanical Design
- Small Mechanisms
- Quality Control and Test Engineers

More and more these days you hear top engineers talk about the many growth opportunities at Melpar. With an increasing number of significant electronic projects, an enlarged staff and facilities, Melpar provides many opportunities for professional growth and advancement. Our new laboratory is an engineer's dream come true; a building conceived by and constructed for the ENGINEER – 265,000 sq. ft. of complete engineering facilities.

We are located in Fairfax County of northern Virginia where housing is reasonable and plentiful—whether you desire a private home or an apartment. Although we are in a truly suburban atmosphere, we are only 10 miles from the nation's capital with all its recreational and social advantages. Here you and your family can grow in an environment to match your professional growth.

Send resume to Technical Personnel Representative,

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North Texas

Chapter members were guests of Lt. Col. R. H. Vinding, chapter vice-president, and LCdr. J. A. Gustavus, secretary-treasurer, at a Christmas party on December 9th at the Officers Club, Naval Air Station, Dallas. A social hour opened the evening's activities and was followed by a dinner and dance.

On January 30th, ninety-two members and guests toured the General Motors Assembly Plant in Arlington, with precision and coordination of manpower and material the theme of the evening. Surrounded by moving assembly lines, the group saw and marvelled at the ease with which workers swifty added each part to the Buicks and Pontiacs.

At the close of the tour, the members and guests adjourned to the Peoples Fine Food Cafe for dinner and a fellowship hour.

Paris

Highlight of the December 8th meeting was a film describing the descent to a depth of over 4,000 meters, made in February 1954, at Dakar by two French officers, George Houot and Pierre Willm, in the Bathyscaphe FNRS III. The film showed the successive stages of the planning, construction and tests of the bathyscaphe, and also showed some unusual underwater pictures taken at various depths.

Maj. Gen. E. Blair Garland, Chief Signal Officer, SHAPE, and first vice president of the chapter, gave a brief talk concerning the film before it was shown. Guest of honor was M. l'Ingenieur Principal du Genie Maritime Pierre Willm who told of some of his interesting experiences with the bathyscaphe.

Many distinguished members and guests were present from government, European and American industry and defense services. Among them were: RAdm. Joseph N. Wenger, Director of Communications-Electronics, EUCOM and second vice president of the chapter; M. l'Ingenieur General E. Combaux, Chef du Service des Telecommunications d'Armement; Mr. A. Moreau, Deputy Assistant Secretary General for Production and Logistics, NATO; M. l'Ingenieur en Chef du Genie Maritime Giboin, who introduced Commandant Willm to the gathering, and Dr. Maurice E. Deloraine, Director du Laboratoire Central des Telecommunications.

Philadelphia

On January 19th and 20th, an Armed Forces Regional Industry Symposium was held at the Bellevue-Stratford Hotel in Philadelphia to discuss problems of industrial support for defense readiness.

The symposium was sponsored by the various Armed Services Procurement Planning Officers who comprise the Industrial Mobilization Planning Area Council (Pennsylvania-Delaware) for the Department of Defense, and several civilian organizations representing industry. The AFCEA Philadelphia Chapter was one of the sponsoring organizations—the others were the American Ordnance Association, National Security Industrial Association, Radio, Electronics and Television Manufacturers Association, Society of American Military Engineers and The Quartermaster Association.

Report on the symposium appears on page 30 of this issue.

Philippine

Guest speakers at the chapter's December 5th meeting were D. K. Bailey, chief scientist for Page Communications Engineers, Inc., and Donald Hoff of the receiver relay station for the Voice of America near Baguio, Philippines.

Mr. Bailey presented an instructive talk on "Forward Scatter" and its operating techniques, and Mr. Hoff gave the inside story on what the Voice of America is accomplishing in the Far East.

Practically all of the chapter's sixty members were present. Visitors included Brig. Gen. Graul, Commanding General, 1813th AACS Wing; Col. Charles J. Harrison, Director of Communications-Electronics, FEAF; Col. Thew J. Ice, Jr., Director of Communications, PACAF, and Col. Orville Laird, Director of Communications, Air Task Force 13 Provisional. During the meeting, Brig. Gen. William L. Lee, Commander, 13th Air Force, was unanimously voted an honorary member of the chapter.

Pittsburgh

A color television demonstration in the Hamburg Brothers auditorium was the feature of the November 14th meeting. The chapter had been invited by Elmer Hamburg of Hamburg Brothers, regional RCA distributors, to view the great improvement in color television since its visit to the same auditorium a year and a half ago.

A factory color expert explained that the RCA-developed color compatible system is now used by all broadcasters and manufacturers. After the discussion, "Producers Showcase," the RCA-NBC hour-and-a-half color TV spectacular was viewed on two 21" receivers. At the conclusion of the meeting, the members and guests enjoyed a buffet snack, courtesy of the host.

The chapter's annual holiday party on December 9th was the most successful event to date, with 285 members and guests in attendance.

The East Liberty Armory was the scene of the party which began with dancing and socializing, followed by a buffet. Door prizes included an RCA radio-phonograph combination, an electric skillet and a clock-radio. In addition, a 21" RCA color TV set was raffled off.

On January 20th, 158 members and guests toured Station KDKA-TV studios

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and watched a live musical extravaganza put on the air. Seventy-six of the members met for dinner at Gateway Plaza prior to the show.

The group watched the Iron City Beer program—Slim Bryant and his Wildcats—go on the air, and it was the consensus of opinion that the Wildcats show was much more entertaining in production than in viewing over the set at home. Following the program, guides conducted a tour of the facilities at Pittsburgh's only major TV station.

San Francisco

Annual elections on February 1st retained most of the 1955 officers and directors in office for another year. Headed by President C. L. Wickstrom, Pacific Telephone and Telegraph Co., the re-elected officers are: 1st vice president — Cdr. Sidney N. Barton, Mackay Radio and Telegraph Co.; 2nd vice president—Maj. Thomas D. Razovich, Station KFRC; secretary—Karel W. Goossens, Pacific Telephone and Telegraph Co., and treasurer—Russell H. Cobb, Western Union Telegraph Co.

Elected to the post of historian was Lt. Col. William G. Damerow, Pacific Gas and Electric Co., a former director.

Re-elected to the board of directors: Col. S. S. Cerwin, Signal Officer, Hq. 6th Army; Ralph A. Krause, Stanford Research Institute; John F. Parachini, Radio Marine Corp.; LCdr. W. H. Phillips, Globe Wireless, Ltd.; Robert Sackman, Ampex Electric Co.; C. J. Napier, Sylvania Electronic Defense Lab.; Robert C. Gray, Remler Co., Ltd., and Col. Lloyd C. Parsons.

New members of the board are: Capt. E. B. Patterson, Communication Officer, Western Sea Frontier; Cdr. G. L. Ottinger, Chief, Electronic Engineering Section, 12th Coast Guard District; and Maj. Gordon A. Stevens, Eastman Kodak Co.

Guest speaker of the dinner-meeting was Col. John C. Alison, Director of Communications-Electronics, Western Air Defense Force. His subject was SAGE, the Air Force project for improving air defense by applying semi-automatic operation to the handling of information and the direction of weapons. Colonel Alison demonstrated his talk with a 25-minute film on the subject.

Held at the Officers Club of the Hunters Point Naval Shipyard, the meeting was attended by more than one hundred members and guests.

Paris. Some of the guests at the December meeting. Left to right: M. l'Ingenieur en Chef du Genie Maritime Giboin; Mrs. Maurice E. Deloraine, wife of the Director of Laboratoire Central des Telecommunications; M. l'Ingenieur General E. Combaux, Chef du Service des Telecommunications d'Armement; Mrs. E. Blair Garland, wife of the Chief Signal Officer, SHAPE; and M. l'Ingenieur Principal du Genie Maritime Pierre Willm.

Scott-St. Louis

Col. Gus B. Hoffman, Director of Communications-Electronics, Hqs. Central Air Defense Force, Grandview Air Force Base, discussed the "Mission of the Air Defense Command" at the January 6th dinner-meeting. He illustrated his talk with a set of charts and at its close conducted a question and answer period. The meeting took place in Bonnelle's in St. Louis, with fifty-five members and guests in attendance.

On February 3rd, the chapter met at the St. Louis Police Academy to hear Capt. Joseph J. Gallagher, Superintendent, speak on "The H-Bomb and You."

Captain Gallagher, as a member of the team of St. Louis Civil Defense workers, had participated in the test atomic blast conducted in Survival City, Nevada, during the past year. With this firsthand experience, he was able to give the AFCEA group an authoritative and stirring report on the H-Bomb and its effects.

A pre-meeting dinner was held at the Mark Twain Hotel.

Seattle

"Hi Fi" was the featured subject at the chapter's December 14th meeting, with Jim Hess of Seattle Radio Supply, Inc. in charge of the program.

Mr. Hess clarified the meaning of "Hi Fi" by explaining that the objective is to faithfully reproduce sound up to the capabilities of the human ear, and pointed out that the better systems have been developed to the point where almost perfect reproduction can be obtained. A demonstration system was set up and Mr. Hess demonstrated high fidelity reproduction of various types of music.

Annual elections on January 11th brought the following into office for 1956: president — Raymond J. Laine, Seattle Radio Supply, Inc.; vice-president—LCdr. Carl C. Lischke, Mackay

New York. 1956 chapter officers and directors. Front row (l/r): David Talley, secretary; L. R. Engler, vice president; Stanley F. Patten, president; H. R. Bang, vice president; T. N. Pope, treasurer. Back row (l/r): Directors T. L. Bartlett, D. F. McClure, T. H. Mitchell, L. F. Spangenberg, W. L. Hallahan, T. Brown, E. C. Carlson, F. H. Lanahan and W. S. Anderson.

Radio and Telegraph Co.; secretary—Merrill R. Stiles, Alaska Communication System; treasurer — Lee David, Boeing Airplane Co.

New trustees were elected as follows: Charles I. Schenefield, Alaska Communication System; Roy A. Peterson, West Coast Telephone Co., and Lt. Col. Elmer R. Higgins, outgoing president. Incumbent trustees with one more year to serve are Warren Taylor, Boeing Airplane Co., and Merrill O. Peoples, Alaska Communication System.

Guest speaker at the dinner-meeting was Peter L. Balise, Assistant Professor, Department of Mechanical Engineering, University of Washington, who discussed the timely subject of automation.

At the outset, Mr. Balise pointed out that there are two common misconceptions of automation, i.e., that it is an entirely new concept and that it always involves a complicated control system of electronics. He defined automation as the turning of a process into automatic operation with automatic equipment to provide complete control. He outlined the various principles of control involved, ranging from simple "on-off" control (thermostat) to "rate-action" in which control is based on rate of change of a process. He also defined the three major types of control as electronic or electrical, hydraulic and pneumatic.

The new officers were officially installed by Colonel Higgins, retiring president, who was given a vote of appreciation from the chapter for his leadership during the past year.

South Texas

The chapter's December activity was a buffet dinner and meeting at Brooks Air Force Base Officers Club on December 13th.

The program consisted of two interesting sound films. The first was IBM's "Direct Line to Decision," a non-technical color film describing the application of large scale electronic data processing machinery to business record keeping and to control. The second was a military film entitled "Self Preservation in A-Bomb Attacks."

The San Antonio Air Defense Filter Center was the scene of the January 17th meeting. Maj. Ben Baines, Commander of the Center, was host to the chapter group.

The program was divided into three parts: an overall briefing on the mission and use of the Ground Observer Corps, an illustrated film on the Air Defense System, and a tour through the Center to observe the operations room in action.

Southern California

The chapter's December 8th meeting at the Town House, Los Angeles, had as its principal speaker The Reverend William J. McIntosh, S.J., Director of Loyola Industrial Relations Center, Loyola University, Los Angeles.

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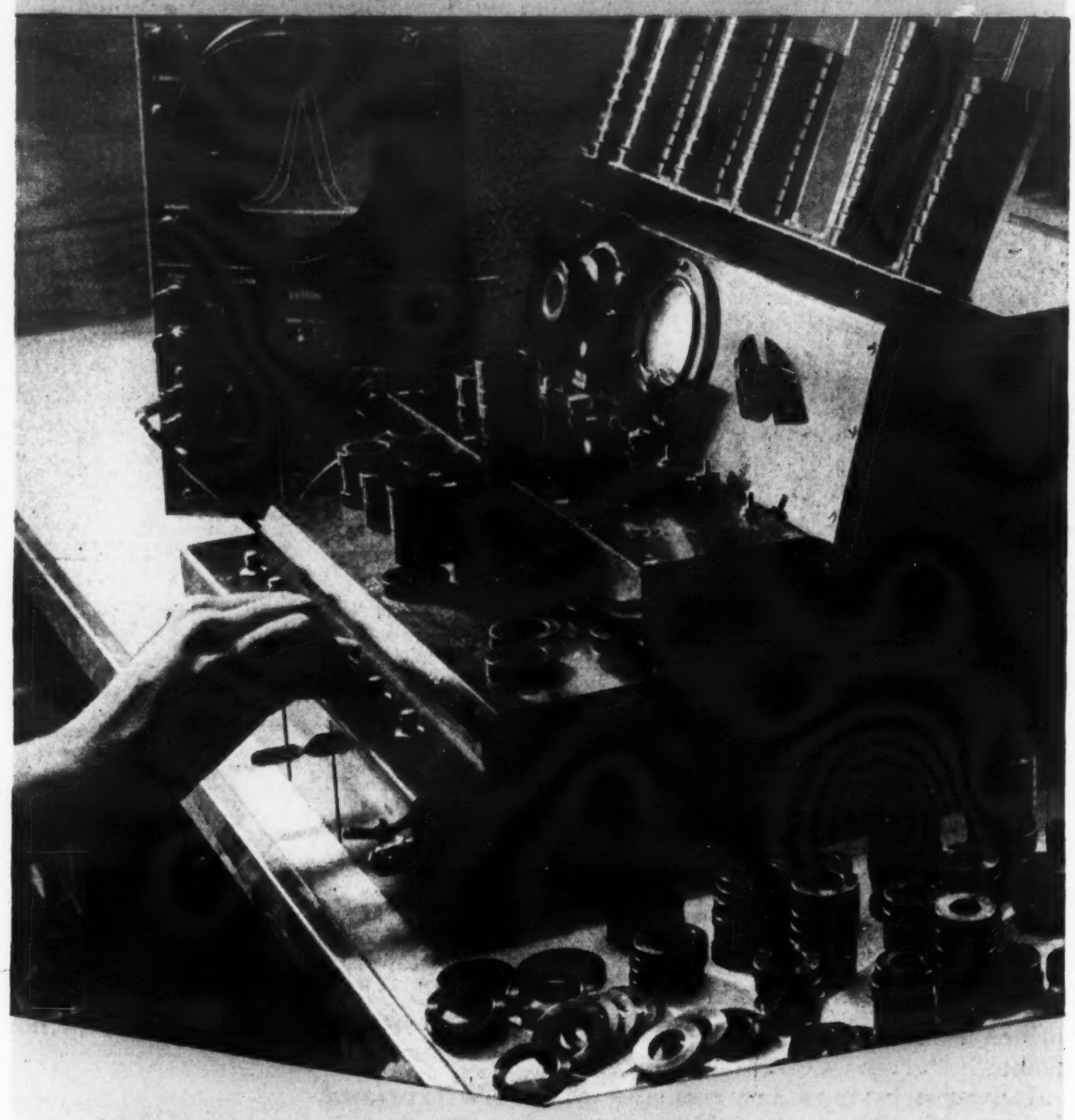

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CHAPTER NEWS

Father McIntosh discussed the "profession of management" and the contribution it can make to society. He said: "With a commendable will, with an eagerness to learn and a marked capacity to understand, professional men of management must rise from the ashes left in irresponsibility's wake and erect in industry and in their company an edifice dedicated to the primacies of individual liberty and personal dignity, and in the ensuing process there will be created a true democracy in business committed to the advance of business morality, freedom of economic enterprise and social justice."

See "Quotes in Review" on page 17 for additional excerpts from Father McIntosh's thought-provoking address.

Southern Connecticut

In line with the chapter's new policy of holding its meetings in various locations, the January 19th meeting was held in Danbury. Despite threatened bad weather, an excellent turnout of members and special guests from the Danbury area were on hand to hear Mr. A. E. Diem, vice president in charge of manufacturing, Dictaphone Corporation, deliver the principal address at the dinner-meeting.

Speaking on "Communicating with Employees," Dr. Diem highlighted his principal points with illustrative anecdotes from his wide experience in human relations. He stressed the point that the basic premise involved in communicating with employees—or in any dealings with people, for that matter—is that one must never trade his basic principles to win some momentary point.

It is also basic to any company operation, Mr. Diem stated, that an objective be ever present and, in this connection, the greatest asset any company has is its employees. Tools, equipment, etc., can be purchased; people devoted to the company objectives cannot. Mr. Diem further said that employees must be developed, educated and cultivated to believe in the company s objectives. People can no longer be told that they must do this, and it must be recognized that today people must be logically convinced to believe in the company's objectives so that they will consent to the successful operation of the company.

The principles of "Communicating with Employees" were developed by Mr. Diem as follows: (a) employees should know all there is to know about the business operation; there should be no secrets except salaries of others and new product development; (b) everything stated and done must be truthful; (c) whatever is done must be from the heart and with sincerity, not for effect; (d) one should never be against something per se, unless for something better; (e) "Communicating with Employees" should not be delegated to high-pressure specialists but is a continuous responsibility of each and every individual in management; (f) one must stand up for his basic convictions and must never give in on these beliefs and principles in order to make friends—for instance, in bargaining during a strike, principles must never be traded for money or for the sake of some temporary "issue."

Mr. Diem's address held the interest of all those present, the chapter reported, and a lively discussion period followed the formal talk.

During a brief business session, Bernard Rosenberg, chairman of the membership committee outlined a direct mail campaign for new members now in progress.

Switzerland

The Geneva Sub-Chapter of the Paris Chapter went out of existence on January 23rd when it formally petitioned for a separate charter as the Switzerland Chapter of the Association. The petition was approved and the charter was officially presented at national headquarters to Col. John H. Gayer, president of the chapter, who was on leave in the States.

Other officers elected for 1956 are vice-presidents — Col. Robert Miller, SigC, OARMA, American Embassy, Cdr. Cornelius G. Mayer, Laboratories, RCA, Ltd.; secretary—Capt. Gerald C. Gross, Assistant Secretary General, International Telecommunications Union. treasurer—Miss Thelma R. Tharpe, International Telecommunications Union. Committee chairmen are: Robert V. Lindsey, membership, and Louis Rosheger, program.

The chapter's February 10th meeting featured an illustrated talk on "Signal Communications Progress in the Royal Thai Armed Forces" by Col. Randolph V. Fite, Chief Signal Officer, V Corps, Frankfurt.

Colonel Fite's talk was based on the very interesting and sometimes exciting adventures he had in Thailand while building a telecommunications school for the Thailand Government from the ground up.

The meeting was preceded by an informal dinner at the Hotel des Bergues, Geneva.

Tinker-Oklahoma City

A dinner-dance marked the holiday season for the chapter membership. Held at the Officers Mess, Tinker Air Force Base, on December 16th, the event was attended by forty-one members and guests.

On January 13th, a symposium meeting was held at the University of Oklahoma. The speakers were: Professor Ansel Challenner, School of Engineering, University of Oklahoma, who discussed the role of universities in military research, and Loyd G. Dorsett, president of Dorsett Laboratories, Inc., who spoke on the role of industry in military electronics.

San Francisco. Col. John C. Alison, Director of Communications-Electronics, Western Air Defense Force, addresses the February 1st chapter meeting. At the head table are (l/r): Col. H. L. Schnoor, Maj. Gen. Kirke B. Lawton, Col. H. P. Roberts, Col. C. I. Hoppough, Col. S. S. Cerwin, Col. Alison, President C. L. Wickstrom, Secretary K. W. Goossens and Capt. E. B. Patterson, USN.

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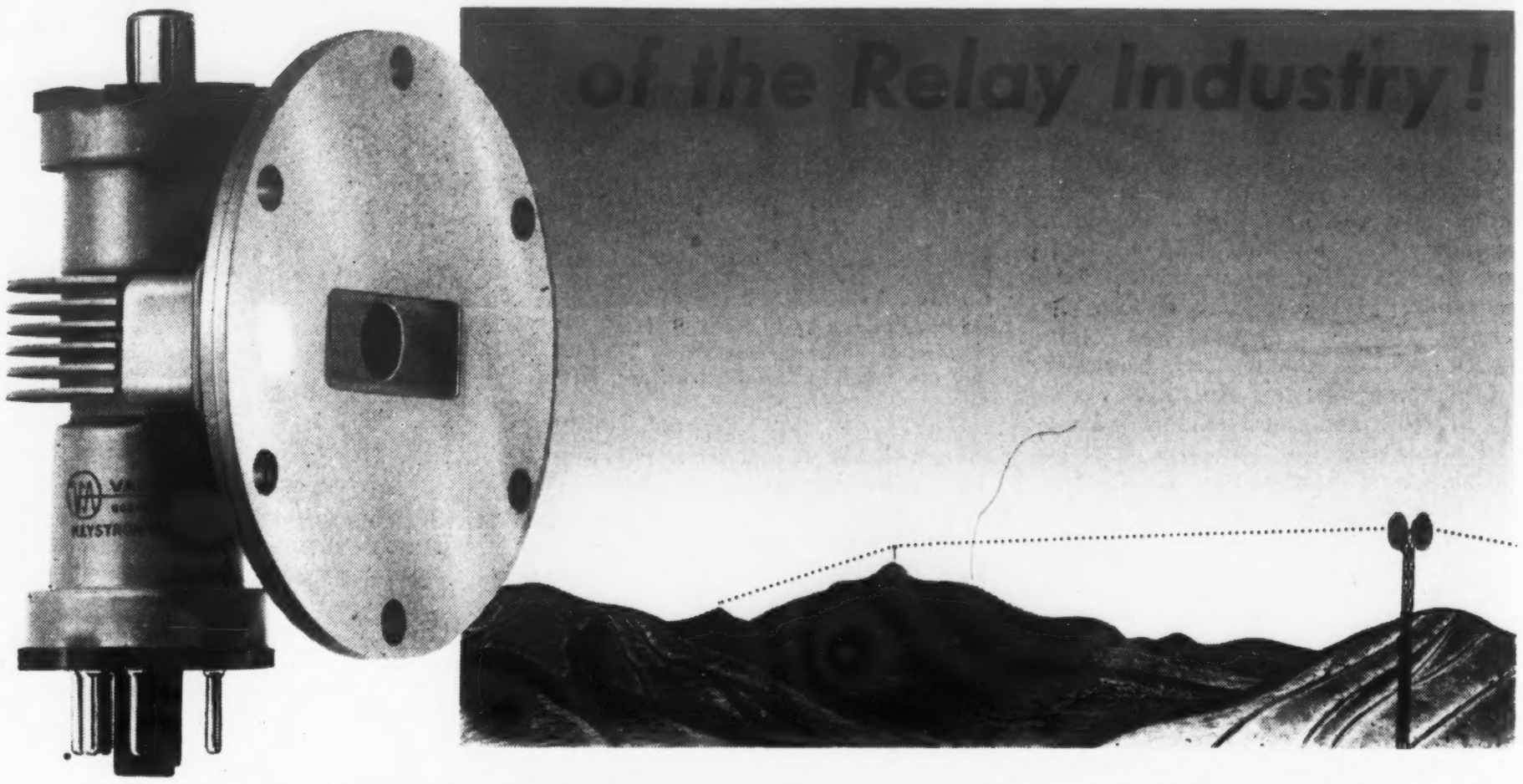

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CHAPTER NEWS

Among the ninety-two members and guests present were the Professors of Air, Military and Naval Science at the University: Col. Morgan Goodhart, USAF; Capt. W. B. Mechling, USN, and Col. Edward F. Thelan, USA. Other special guests of the evening were: Representative and Mrs. Robert L. Bailey; Mr. and Mrs. T. R. Benedum, attorney; Mr. and Mrs. Phil C. Bennett, vice president, Mid-Continent Life Insurance; Mr. and Mrs. Thomas E. Bennett, attorney; Mr. and Mrs. Stanley Draper, Oklahoma City Chamber of Commerce; Dr. and Mrs. J. O. Hassler, director; Mr. and Mrs. Philip Honnold, securities; Col. and Mrs. Carl D. McGee, tank operations; Capt. and Mrs. Loyd W. Parrish, N.A.T.T.C.; Mr. and Mrs. Fred Schonwald, attorney, and Mr. and Mrs. R. J. Symcox, president, First National Bank.

Chapter Vice President Jack W. Grewell, CAA, reported on the progress of the chapter's latest project. He stated that due to the widespread concern about high school students' lack of interest in science, the Tinker-Oklahoma City Chapter was initiating a plan to assist science teachers in local secondary schools. This plan calls for qualified AFCEA members to visit science classrooms and participate in a question and answer period on a subject being studied by the students. The chapter feels that by careful coordination with the school administration and in conjunction with a survey to determine areas of knowledge among its chapter members, it can increase student interest and be of material assistance to the teachers concerned.

Southern Connecticut. Mr. A. E. Diem, Vice-President in charge of manufacturing, Dictaphone Corporation, is shown addressing the January 19th meeting held in Danbury. The subject of his talk was "Communicating with Employees."

This project is now being tested in one of the local schools, and a number of chapter members have volunteered to conduct these classroom sessions. The chapter hopes to be in a position soon to evaluate progress being made.

Scott-St. Louis. Col. Gus B. Hoffman, Director of Communications-Electronics, CADF, uses a chart to illustrate his talk on "The Mission of the Air Defense Command" before the January 6th meeting. Looking on are, left to right: Lt. Col. William J. Trigg, Karl Ganssle and Earl Hagen.

Tokyo

An Executive Council meeting of the Tokyo Chapter was held on January 26th. Plans were formulated for the next general meeting to be held in February for which the Army was to be host, with Lt. Gen. Charles D. Palmer, Deputy Commanding General AFFE/8th Army, scheduled as guest speaker. The meeting place was designated as the Golden Dragon Club in Yokohama and it was anticipated that some 200 members and guests would be in attendance.

At the Council meeting, James J. Greene, publicity chairman of the chapter, was chosen to represent the Tokyo Chapter at the 1956 national convention in Boston. While in Boston, Mr. Greene desires to set up a meeting with attending publicity chairmen from other chapters at the Statler Hotel during his stay, and urges such chairmen to contact him by writing him at the following address: Mr. James J. Greene, Civilian Housing Area, Box 122, Hq NAMAP, APO 323, San Francisco, California.

Washington

The growing interest of the United States military services in scatter technique for point-to-point radio communication was summed up for Washington Chapter members and guests by Maj. Gen. Francis L. Ankenbrandt, Director, Communications-Electronics, The Joint Chiefs of Staff, at the monthly luncheon meeting in January.

Telecommunications Reports reported his address as follows:

"General Ankenbrandt said military interest in this 'infant' means of transmission is inspired by its reliability; frequency conservation, all of it outside the HF range; and lower expense resulting from the need for fewer relays. 'Many new circuits are being programmed' based on the scatter principle and 'you'll hear more and more of this technique as time goes by,' he declared.

"General Ankenbrandt, who served in Europe as Chief Signal Officer at SHAPE from September 1951 to September 1954, also reported on the development of the NATO Electronics-Communications Board and of its activities, and then presented a picture of telecommunications in Russia.

"The telecommunications existing in Soviet Russia would be considered inadequate in a quantitative sense but not in a qualitative sense by our standards, General Ankenbrandt declared. He said Russia has a government-owned, comprehensive, well-integrated, effective telecommunications system that provides telephone and telegraph service to all of the vast country. Open wire is used for the most part, except in Moscow.

"Russia's extensive radio and wire facilities are designed for both peace and war and are operated by government officials who would merely have to don uniforms and continue in their jobs if hostilities broke out, he said. Facilities are being modernized quite rapidly, and the most recent five-year plan of the Soviet government had the modernization of telecommunications near the top of its list of projects.

"While Russia claims many 'firsts', it can boast of being a true pioneer of high-powered radio transmissions, Gen-

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Southern Connecticut. Newly elected chapter officers shown at the January meeting. Left to right: I. T. Shapiro, treasurer; Charles Ecklund, director; Lincoln Thompson, president; Spencer Montgomery, Jr., vice-president, and John N. Higgins, secretary.

eral Ankenbrandt stated. The country was one of the earliest users of wire distribution of broadcast programs in metropolitan areas, and a large amount of research and development is going into UHF, pulse modulation, high speed transmission, facsimile, television, solar propagation, and other new techniques. 'We can be assured they know much of scatter transmission,' he stated.

"Great emphasis is placed on radio, with more than 1000 established stations and with the radio system well-integrated with the wire network. In regard to television, General Ankenbrandt said Russia is using Western techniques."

In conjunction with its February 2nd meeting, the chapter staged an all-day automation exposition at the Willard Hotel. Exhibitors were the American Car & Foundry, Admiral Corporation, General Electric Company, General Mills, Melpar, Inc., Radio Corporation of America, Stromberg-Carlson Company and United Shoe Machine Corporation.

The luncheon was addressed by Dr. A. V. Astin, Director, National Bureau of Standards on "The Origin and History of Automation"—see page 44 of this issue for text of his speech.

The exhibits were open to the public free of charge and films on automation were shown continuously through the day. Approximately 1,000 persons visited the exposition, with over 600 members and guests attending the luncheon-meeting.

Don't Forget to Return Immediately the Convention Registration Card on Page 35.

Student Chapter

Iowa State College

The chapter meets every other Tuesday, with a good-sized attendance of members and guests. Programs usually include a speaker and a short film on some phase of communications or electronics.

A recent meeting was addressed by Dean Black, head of the Mechanical Engineering Department, who gave an outstanding talk on the unusual subject —"If Good Communications had been available during the Civil War."

Northeastern University

The chapter has gained such recognition on campus that it has been granted a permanent room by the University, which now serves as the chapter headquarters.

At the last combined meeting of Divisions A and B, members were invited to bring their dates. Major Fred Frank, Assistant PMS&T, was the speaker and gave an interesting tour of Europe via color slides and movies. Coffee and doughnuts were served at the conclusion of the program and the chapter reports a very successful evening. As a result, dates will be invited to all future combined meetings (held once each quarter) and the annual banquet.

The chapter now has three advisors assigned to it from the staff of the Military Science Department—Captains James H. Reego, Charles P. Skinner and Frank D. Stevens.

Chapter members are taking an active part in preparations for the national convention being held in Boston in May.

Southern California. The chapter's December meeting was addressed by the Reverend William J. McIntosh, S.J., Director of Loyola Industrial Relations Center, Loyola University, L. A. Shown, left to right, are: William Cooke, President Charles A. LaHar, Father McIntosh, Vice President Lester R. Daniels and Treasurer Joel H. Axe.

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ITEMS OF INTEREST
From Government, Industry and the Services

New Advance in Transistor Technology From Bell Labs

A major achievement that opens up new possibilities in electronics has been reported by the Bell Telephone Laboratories. New fabricating techniques for an entirely new kind of transistor, technically known as the diffused base transistor, have been developed by the Laboratories.

The new techniques involve the adaptation of the chemical of "diffusion" used in treating silicon for the Bell solar battery.

The transistor consists of a three-layer chemical "sandwich." The center layer is known as the base. The other two are the emitter and collector layers. The narrower the base layer can be made the higher the frequency at which it will operate. Diffusion provides a high degree of control of such microscopic dimensions.

Because of its very high frequency characteristics the new transistor appears to be ideally suited for application in guided missiles and electronic "brains" for military and computer uses.

Thus far, the new transistors have been found to reach a frequency cut off between 500 and 600 megacycles. Even though the effective operation of many military electronic devices is in a much lower megacycle range, the higher frequency cut off would provide a greater number of communication channels or more amplification than previously possible.

One of these transistors could amplify 2,500 telephone conversations simultaneously on a telephone line. This is three times as many as could be handled by the best previous transistor. Color television sets offer another possible application. The new transistor is much smaller, requires less power, does not heat up like a tube and is expected to have a longer life than a vacuum tube.

Series of Monographs Prepared by AEC

The Atomic Energy Commission is now sponsoring a series of monographs designed to encourage industrial interest in applications of atomic energy.

Generally, these monographs will present brief narrative summaries of information which has already been made available in the form of more detailed and formal reports. Copies of each report in the series will automatically be distributed to the press, to the AEC depository libraries, and placed on sale at the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Two examples of monographs released in January are: "Gamma Radiography of Metal Castings at Sandia Laboratory" and "Gamma Facilities at the Materials Testing Reactor."

TELEMETERING JETS IN FLIGHT

Telemetering—the electronic technique best known for its use in tracking guided missiles from the ground—will be used for testing many functions of jet aircraft in actual flight instead of on the ground.

While the jet plane climbs, dives and goes through other maneuvers at various speeds and altitudes, pick-up devices on the plane will sense such things as engine speeds, internal pressures, temperatures and rates of fuel flow. These are converted into radio signals and instantly recorded on the ground.

To make the most effective use of telemetered flight tests, Bendix Aviation Corporation has developed a mobile instrumentation set-up or "laboratory on wheels" housed in a truck-trailer that can be parked near the flying field from which the test plane is operating.

One of the advantages of the new system is the immediate availability of data on a large plotting board. Up to now, the usual method of observing jet-engine performance has been through ground tests where the engine is stationary, usually located in a test cell next to the recording equipment and instruments. With telemetering, laboratory-type test equipment can be "connected" for the first time to a jet engine in actual flight.

According to a Bendix spokesman, the telemetering system will have a number of industrial applications, particularly in the automotive field. It could record such data as transmission speed slip during acceleration, shock absorber performance, the effect of road shock on a power-steering system or virtually any other detail of automotive performance.

ARMED FORCES DAY
May 19, 1956

The 1956 observance of Armed Forces Day, on Saturday, May 19th, will again be keyed to the fact that the Armed Forces of the United States represent "Power for Peace," a slogan so appropriate that it has been retained from the 1954 and 1955 programs for use in this year's Armed Forces Day.

Observance of Armed Forces Day is now essentially an "open house" program designed to promote public interest in and understanding of our Armed Forces. By inviting the public to visit posts, camps, stations, bases, and other national defense facilities, the public is given an opportunity to make an annual inspection of the defense system in which every American has a stake.

May 19, 1956

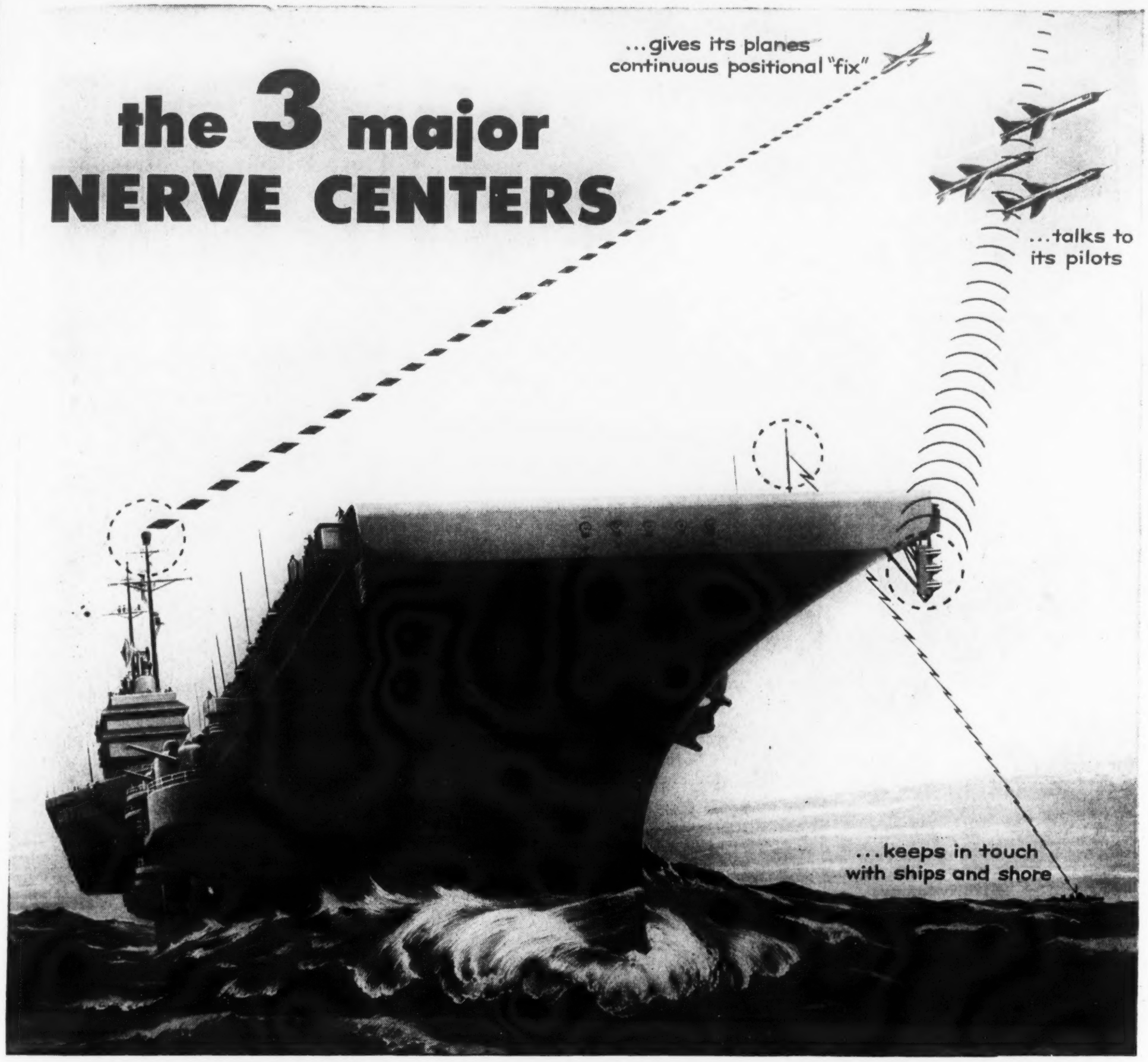
VHF-UHF Radio Developed For Army Helicopters

A lightweight radio receiver-transmitter that can be tuned to both VHF and UHF frequencies is now being produced by Admiral Corporation for use in U. S. Army helicopters and other light military aircraft.

The transceiver, officially designated the AN/ARC-55, is a smaller lighter version of the all-channel airborne ARC-27, which the company

(*Continued on page* 70)

the 3 major NERVE CENTERS



of the Mighty FORRESTAL

The U.S.S. FORRESTAL . . . 60,000-ton sea giant . . . the most powerful carrier afloat . . . owes much of its fighting efficiency to its modern sensory system . . . including its advanced-design communication and air navigation "nerve centers" developed by Federal Telecommunication Laboratories, a division of International Telephone and Telegraph Corporation.

To guide its planes safely home through darkness, fog, and stormy weather, the FORRESTAL utilizes Tacan . . . revolutionary new system that continually indicates position of moving ship to its fast-flying planes.

To keep in constant two-way voice contact with its pilots in the air, the FORRESTAL uses a new ultra high frequency radio system . . . with an effective range over one-and-one-half times greater than many previous systems . . . beaming its power through new-type antennas in new locations below the level of the flight deck.

For ship-to-ship and ship-to-shore communication the FORRESTAL's medium-and-high frequency radio system provides clear and dependable transmission for voice, teleprinter, high-speed code and facsimile.

The same electronic "nerve centers" will be installed on the new super carrier U.S.S. SARATOGA and other great aircraft carriers to come.

These vital developments . . . Tacan, UHF and MHF radio . . . are outstanding examples of IT&T's continuing contributions to electronic progress . . . to the growing might of America's defensive forces.

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SYSTEMS
RAKSCOPE

by Waterman

MODEL S-12-C

INDIVIDUAL
SYSTEMS
ADAPTATIONS

7" HIGH
10" DEEP

ANOTHER EXAMPLE OF Waterman PIONEERING . . .

The S-12-C series of Systems RAKSCOPES have been developed for the dual purpose of monitoring and troubleshooting of rack-mounted equipment. These oscilloscopes obtain a new degree of flexibility with the multiple input selector making possible selection of different signal sources. This optional vertical input selector, with built-in attenuators, selects either front panel connectors for troubleshooting or rear mounted connectors for systems monitoring. This permits the omission of an entire switching panel from an overall system resulting in circuit and space economies. A ruggedized construction philosophy has been carried throughout. Vertical and horizontal amplifiers are identical, each having a frequency response from dc to 700 kc (—2 db). Their sensitivities are 50 and 72 millivolts rms per inch of deflection. Signal amplitude calibration employs a direct reading meter. The time base is operative in either trigger or repetitive modes with a range from ½-cycle to 50 kc. Synchronization is independent of polarity. Sync. lockout circuits are employed for stable operation over wide range of writing speeds and amplitudes. A unique plug-in elliptical sweep network makes frequency calibrations more simplified. Power requirements: 105-125 volts, 50 to 400 cycles. Accessory probes available; attenuator and amplifier types.

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RAYONIC* Cathode Ray Tubes and Other Associated Equipment
*T. M. REG.

ITEMS OF INTEREST

has been producing for U. S. Air Force and Navy bombers and fighters.

Both a transmitter and a receiver, this compact unit contains 56 tubes and approximately 3,000 component parts. No pressurization within the cabinet is necessary and as a result of re-designed components and power amplifier, electrical components will not arc over at high altitudes.

This new transceiver operates between 225 and 400 megacycles on the UHF band, and can be set for automatic tuning to any 20 of the 1750 VHF and UHF channels, with manual selection of the remaining channels. An entirely different set of 20 channels can be selected each day for transmission and reception. The unit becomes an automatic direction finder when used in conjunction with other equipment in the plane.

Fall-Out Warning System Blankets U. S.

The Federal Civil Defense Administration and the U. S. Weather Bureau have announced that the country has been blanketed with a radioactive fall-out warning system that will increase chances for survival in the event of an H-bomb attack.

Previously, the warning or forecasting system covered only the 70 most critical target areas in the country. The system has now been enlarged to include key military and Atomic Energy Commission installations which are not located in or near the 70 critical target areas.

Civil Defense Administrator Val Peterson recently stated that a target city in this country could expect to have about an hour's advance warning in the event of an enemy air attack. However, with the continued advancement of the warning system, the warning period could be advanced to three to six hours within the next 15 to 20 months.

New Teletypewriter Relay System Advanced by AT&T

The Long Lines Department of the American Telephone and Telegraph Company is now making available a push button-controlled private line communications system designed to serve a wide variety of business needs.

Known as the "Bellfast," it is a new teletypewriter relay system with a control center which simplifies the

(*Continued on page 72*)

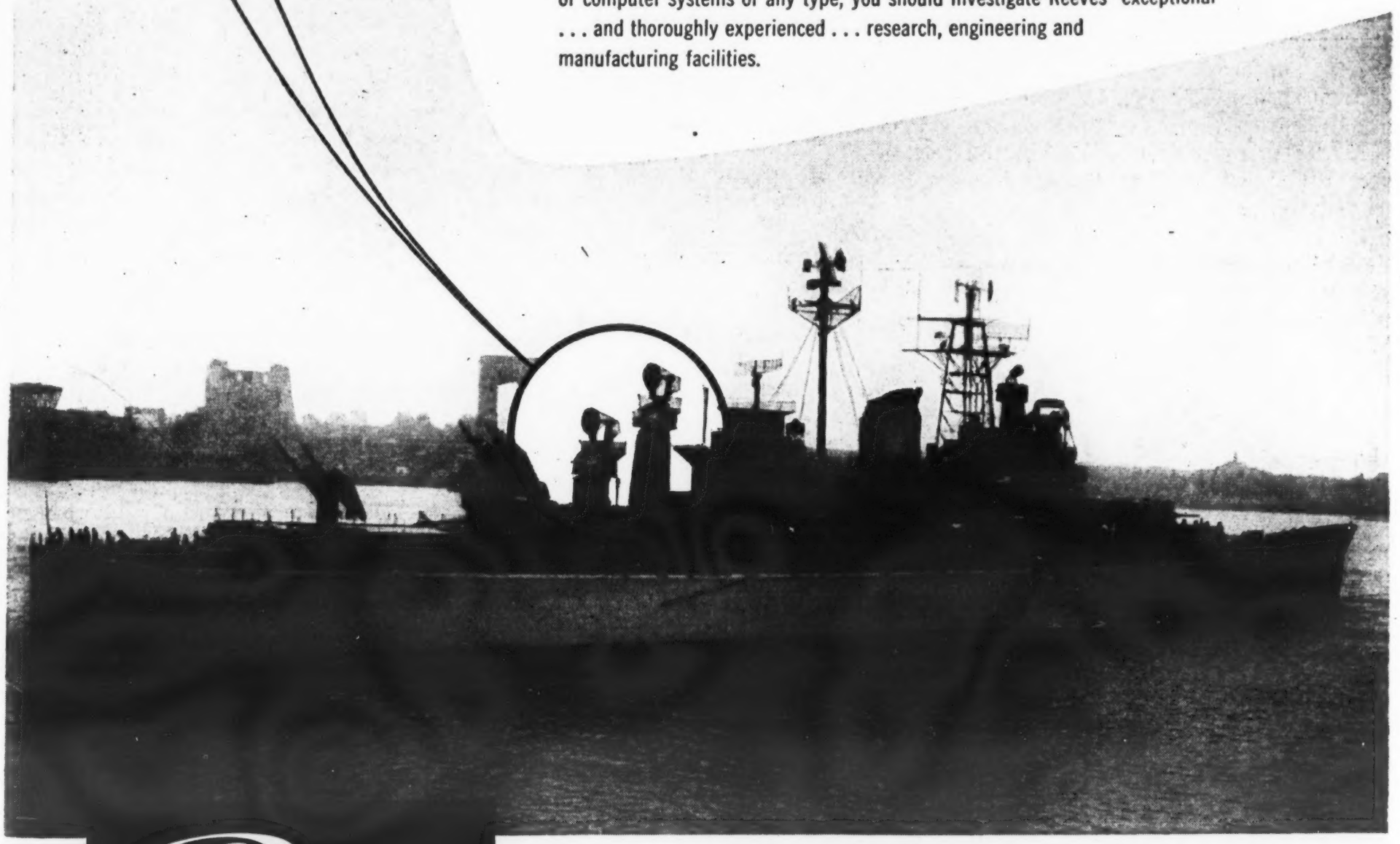
Missile Guidance by Reeves INSTRUMENT CORPORATION

IN U.S. NAVY'S FIRST GUIDED MISSILE SHIP

USS BOSTON, first of the U.S. Navy's guided missile cruisers, highlights another important advance in the continuing program of guidance systems development in progress at Reeves for the U.S. Navy Bureau of Ordnance.

Equipment installed in the USS BOSTON, born of successful experience with previous Reeves installations in USS MISSISSIPPI and USS NORTON SOUND, permits a new high degree of continuous precision control of the ship-to-air missile flight path right up to the moment of impact.

Reeves' work with the U.S. Navy and U.S. Air Force goes back to the earliest stages of their successful missile guidance programs. If you are concerned with the placing of prime or sub-contracts in the fields of missile or aircraft guidance, radar, gunfire control, servo-mechanisms or computer systems of any type, you should investigate Reeves' exceptional . . . and thoroughly experienced . . . research, engineering and manufacturing facilities.



Reeves INSTRUMENT CORPORATION

1RV56A

REEVES COMMAND GUIDANCE SYSTEMS

REEVES INSTRUMENT CORPORATION

A Subsidiary of Dynamics Corporation of America

215 East 91st St., New York 28, N. Y.

relaying of messages. The Bellfast has already been installed for concerns which operate over a wide area.

The system can be used for 60 or 75 word per minute speeds, operated on single or duplex circuits. It may have up to 10 stations per circuit. Transmitters may be used alternately and reperforators may be connected by push buttons to any circuits, permitting quick rearrangements to meet traffic conditions.

Two important features of the Bellfast are the push-button operation at the relay center which electronically selects the called station and turns on its teletypewriter, and the lamp signal at the relay center which verifies that the called station is connected and ready to receive messages.

Messages can be directed by push-buttons at the relay center for automatic transmission to two or more stations on the same or different circuits. Relay center equipment controls the flow of messages from outlying stations; transmission from each station starts automatically.

MARS Conference Sponsored by Oregon National Guard

Eighty-three persons were present at a recent Military Affiliate Radio System conference in Portland, Oregon, sponsored by the Oregon National Guard.

MARS members from Washington and Idaho, as well as Oregon, attended the meeting. Service personnel, civilians, members of the National Guard and Army Reserve were present.

Major Francis D. Ivey, SigC, MARS Director, Sixth Army, was the guest speaker, outlining the new plans for net operations in the Sixth Army area.

Two tours were conducted: one to the Air Force MARS station AF7FCB, and the other to the 142nd Aircraft Control and Warning Flight of the Oregon Air National Guard, where the conferees had an opportunity to see AC&W operations and Air Force MARS station AF7FDF.

Captain William A. Bentson, A7QFY/AA7WBH, Army MARS Director for Oregon, explains the receiving equipment and operation of the Air Force MARS Station AF7FCB during a recent MARS conference. Seated is Mrs. Lucille W. Peck, A7YDF; standing (l to r) are: Ivar J. Lindstrom, A7UZU; Donald W. Misner, A7QWE; and Leslie J. Cowan, A7COZ

SPRAGUE TO PRODUCE PHILCO TRANSISTOR

The Sprague Electric Company of North Adams, Massachusetts, has announced execution of an agreement between Sprague and the Philco Corporation under which Sprague is licensed to produce the Philco surface-barrier transistor.

This is the only transistor currently available for use in high speed computers, essential for improvement of navigation, missile-guidance and weapons-control assemblies. Sprague expects to begin production of the new units shortly after the middle of the year.

Importance of the Sprague-Philco agreement in the electronic world lies in the fact that it will provide for the first time two independent manufacturing sources for an identical high-frequency transistor. Under the agreement, both firms are privileged to exchange research and development data as well as production and testing techniques on devices in the entire field of semi-conductors.

VERSATILE RADIO FOR AIRBORNE OPERATIONS

A new long-range radio for jeeps, tanks and trucks that goes on the air moments after being parachuted-dropped in its vehicle, has been announced by the Army Signal Corps.

This technological advance in the family of ground radio communications was made possible by the joint efforts of the Army Signal Corps Engineering Laboratories of Fort Monmouth and the Collins Radio Company of Cedar Rapids, Iowa.

Up to four times more powerful than the models used in World War II and in Korea, the set combines advanced design with better parts to pack more power into a smaller space. According to recent tests, it has covered over 2,000 miles, gives clear signals and gets through more often than earlier sets.

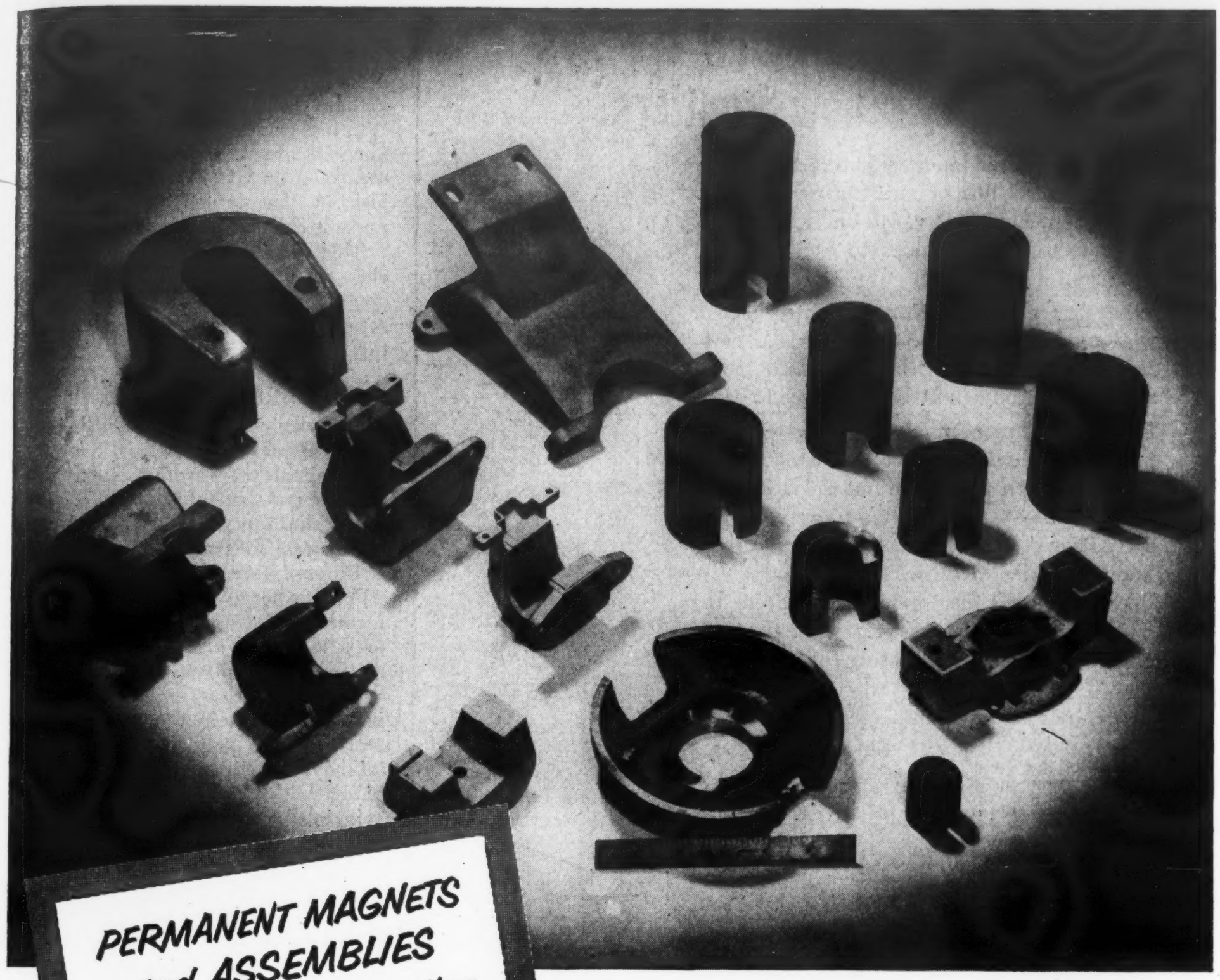
Identified as the AN/GRC-19, this new transmitter-receiver can do many things formerly impossible with any combination of sets in its class. In forward combat areas its extremely wide frequency range offers a better opportunity for infantry, artillery and armor to talk to each other, knitting these units into a harder-hitting tactical team. Messages can now be sent over mountains without relay radios, enabling an airborne group parachuting 200 miles inside enemy lines to report immediately to command headquarters.

Both voice and radio teletype messages can be sent and received at the same time. A few added parts link the Signal Corps lightweight 100-word-per-minute teletypewriter — an impossibility with earlier sets. If desired, the transmitter can be remotely controlled from up to 75 feet away.

Easy to operate, the new radio has seven channels pre-set as in push-button models. The operator merely switches to the one he wants, presses the microphone button, and talks. When he releases the microphone button, the receiver cuts in automatically.

Stability has been so greatly improved that crystals are no longer

(*Continued on page* 74)



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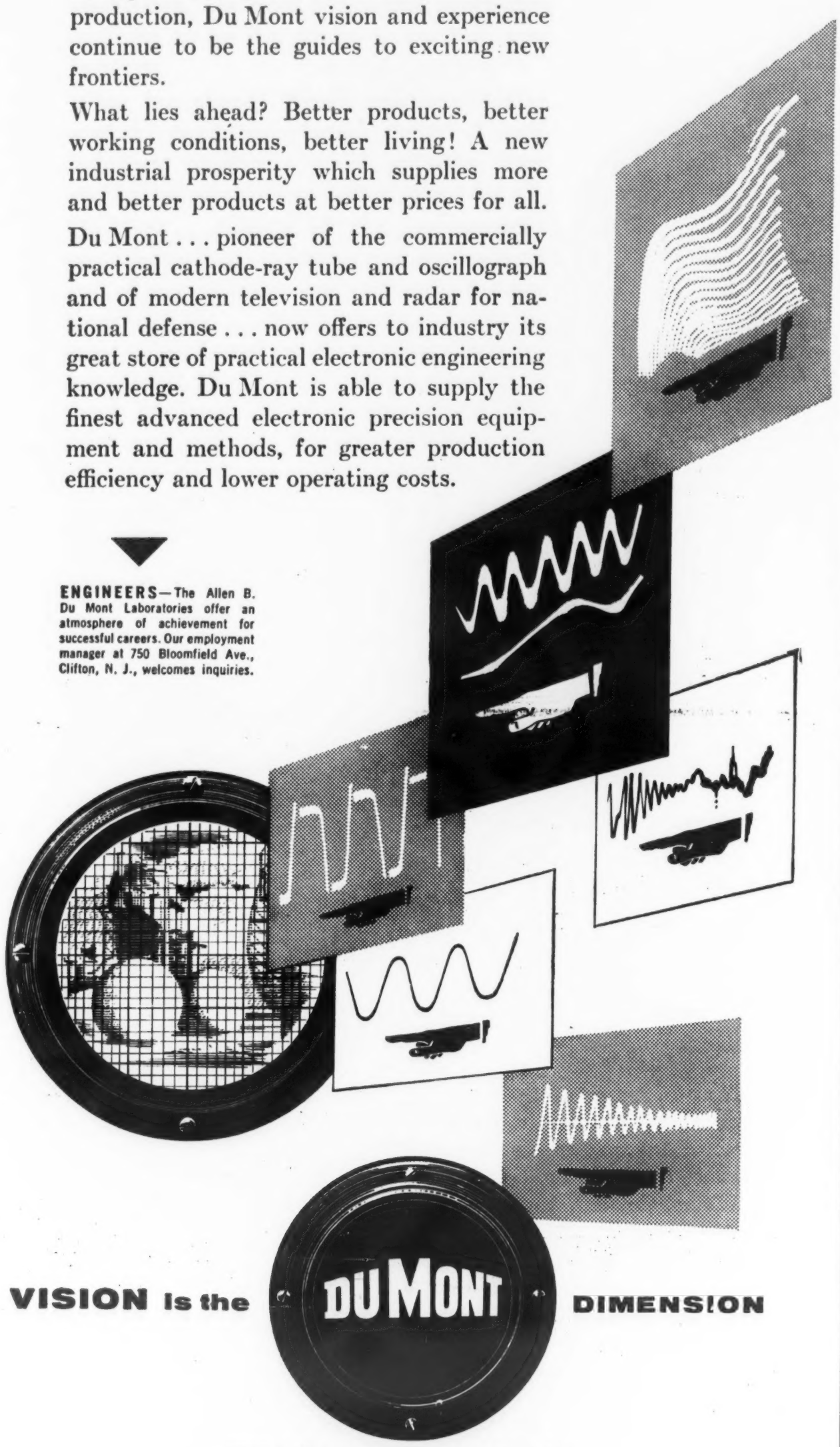

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West Coast Office: 11800 West Olympic Blvd., Los Angeles 64, Calif.

ITEMS OF INTEREST

needed to keep the new set tuned o a channel. This does away with sub stituting crystals whenever new fre quencies are wanted. Earlier model depended on these quartz devices t lock in the wanted frequency an prevent drifting off channel.

This radio is powered by its vehi cle's regular battery, plus a specia generator and fits snugly into its re served space in reconnaissance cars tanks and jeeps.

Pocket-Size Solar-Powered Radio

A pocket-size solar-powered radio receiver, weighing only 10 ounces and capable of working more than eight months in total darkness without recharging, has been developed by General Electric Company.

Because these solar batteries are still too expensive to justify the manufacture of devices in which they are used, G-E has disclosed that it has no immediate plans for production.

Long operation in total darkness is made possible by the use of a miniature storage battery which is contained in a transparent plastic case along with four transistors, seven solar cells and other components. The case is 5½ inches wide, 1¼ inches thick and 3 inches high.

The present size makes it convenient for the user to place the receiver in a suit pocket and hear programs with a miniature ear-plug. The size could be cut in half, G-E said, by substituting sub-miniature components now in existence which were not available when developmental work was being conducted.

The receiver was developed by Edward Keonjian, G-E engineer, and James O'Hern of the company's Advanced Circuit engineering staff.

TWO MORE NUCLEAR SUBS

The Electric Boat Division of General Dynamics Corporation, Groton, Connecticut, has been awarded a contract for the construction of a nuclear powered attack submarine (SSN-585) and a nuclear powered radar picket submarine (SSR(N)-586).

In announcing the awarding of this contract, the U. S. Navy stated that the SSN-585 will be an improved version of the *Skate* (SSN-578) now being built at Groton and the *Swordfish* (SSN-579) under way at the Portsmouth, New Hampshire Naval Shipyard. The SSR(N)-586 will be the first nuclear powered radar picket submarine and will be larger than previous submarines of this type.

The Navy is making a special effort

o increase the number of shipyards apable of designing and building uclear-powered submarines. Mare sland and Portsmouth Naval Shipards will build the SSN-583 and SN-584 respectively.

FURTHER INFORMATION ON SATELLITE PROGRAM

Florida Launching Site

The Air Force Missile Test Center, Patrick Air Force Base, Cocoa, Florida, has been selected as the launching site for Project VANGUARD.

VANGUARD is the code name assigned to the man-made instrumented satellite project which will be launched as part of the United States' participation in the International Geophysical year 1957-58.

It will take a three-stage rocket vehicle to attain the 25,000 feet per second (18,000 miles per hour) velocity that will be required to get the satellite into its orbit. This means that each of the three stages will have to achieve jet velocities.

The first stage, providing a thrust of 27,000 pounds, will start the system on the first part of its flight. When its fuel is exhausted, some 40 miles from the launching site and within about 2 minutes of take-off, the system will have attained a velocity of 3,000-4,000 miles per hour. General Electric Company has a contract with the Glenn L. Martin Company, the prime contractor, to produce the rocket motor for this first stage.

The second rocket stage will then take over, attaining a velocity of about 11,000 mph, burning out at an altitude of about 130 miles, and coasting onward. The Aerojet-General Corporation of Azusa, California, was recently awarded a contract with Martin for the second stage of this vehicle, consisting of a liquid rocket motor and its associated fuel tanks and pressurizing system.

When the system has reached an altitude of about 300 miles, the third rocket will impel the satellite into its orbit at a speed of about 18,000 miles per hour. Contract for this third stage has not yet been awarded.

Its orbit will be inclined approximately 40 degrees from the equator. Once established in its orbit, the satellite must be tracked. A reliable method of tracking, using radio devices, is now under development at the Naval Research Laboratory. Known as "Minitrack," this method uses a miniature radio transmitter in the satellite which radiates a continuous signal to sensitive receiving equipment on the ground.

Employment of this method would also aid optical tracking, by furnishing estimated satellite position predictions, but would require placing a line of observing stations—probably in the Western Hemisphere—to intercept the satellite on its orbit, in fair weather or foul, any hour of the day or night.

The first satellite will be spherical in shape, about 30 inches in diameter, and will weigh approximately 21.5 pounds. Although a spherical shape complicates the design of the overall system, this shape is of considerable interest for measurements of air density.

Of the satellite's 21.5-pound weight, about half will be required for the structure itself, leaving half for various instrumentation, including the telemetering systems.

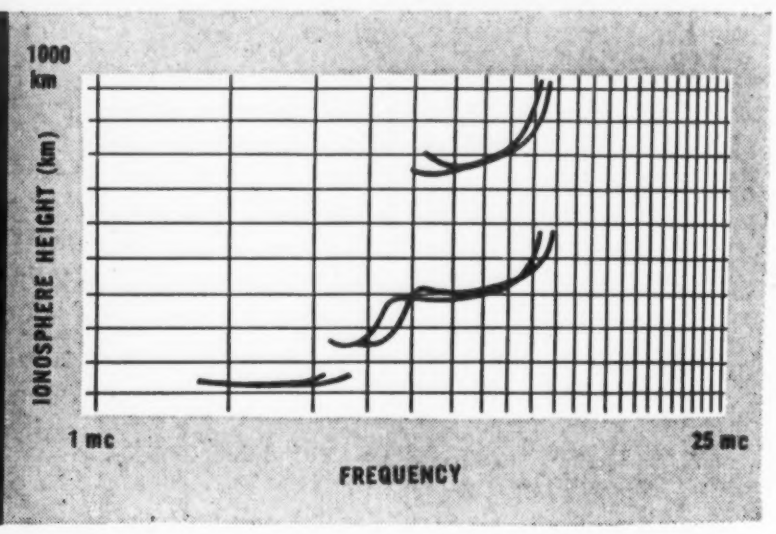
Eight experiments will be undertaken: air density, composition of the earth's crust, geodetic determinations, temperature and pressure measurements, meteoritic observations, studies of extreme ultraviolet radiation from the sun, and cosmic ray intensities. Other experiments are being planned for additional satellites.

(*Continued on page 76*)

for the International Geophysical Year. . . 18 months beginning July 1957

B&W announces Automatic Ionosphere Recorders

(Models C-4 and 9108)



- Precise measurements and recording of the vertical heights and critical frequencies at vertical incidence as part of the IGY program
- Routine and special measurements and recording of the ionosphere as a fixed Ionosphere Station for continuing operation
- Instantaneous prediction of the correct frequency to use in any given azimuth using the oblique-incidence, back-scatter application

These transceiver type radar sets include a pulse transmitter, pulse receiver, master clock programming, and display and recording system. The units are automatic, and the only attention they require is general servicing and film replacement.

Model C-4 is identical to the Ionosphere Recorders B&W has developed and is manufacturing for the U. S. National Bureau of Standards. JAN-ized and ruggedized, in full conformance with military specifications, it is complete with spares for prolonged, continuing operations in isolated locations. The Model 9108 has similar components and circuitry based on the same patents, but it is designed and built to high commercial standards and including all essential operating spares.

Characteristics

Power Input: 90 to 260 VAC
Frequency Range: 1 to 25 mcs
Peak Power Output: 10 kw
PRF: 10 to 60 p.p.s.
Pulse: 50 microseconds
Freq. Sweep Time: 15 to 120 secs.

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B&W holds the exclusive license for manufacture of this equipment.

ITEMS OF INTEREST

ARMY DEVICE DETECTS EFFECT OF RADIATION

A simple, rugged little detector that tells at a glance how much deadly gamma radiation the body has absorbed is ready for mass production for Army and civil defense use.

Developed by Bendix Aviation Corp., Cincinnati division, and tested by the Signal Corps Engineering Laboratories, this "Dosimeter" device resembles a stubby fountain pen which can be clipped in the pocket. It will measure up to 600 roentgens, the measure of gamma radiation absorption. An easy-to-read scale reveals the total radiation the body has been exposed to during the time the dosimeter is worn.

It needs no delicate handling or special care, and in quantity production, estimated cost of the device is less than $10.

National Conference on Aeronautical Electronics

The Dayton Chapter of the Institute of Radio Engineers and the Professional Group on Aeronautical and Navigational Electronics of the IRE are organizing their 8th annual National Conference on Aeronautical Electronics.

This Conference will present to industry and the Services a comprehensive program embracing all phases of this field. The meeting is under the direction of the Conference President, Mr. Richard J. Framme, Chief of Product Control Office, Directorate of Laboratories, Wright Air Development Center.

The conference will be held May 14, 15 and 16 at the Biltmore Hotel, Dayton, Ohio. Official mailing address for the Conference is P. O. Box 621, Far Hills Branch, Dayton 9, Ohio.

Robert W. Gunderson, W2JIO, a blind amateur radio operator of the Bronx, New York, was awarded General Electric's 1955 Edison Radio Amateur Award for having developed more than 30 special sound-producing test instruments that open the field of electronics to the blind. The 36-year old radio amateur is editor of The Braille Technical Press, the only monthly electronics magazine for the blind.

Personnel

Dingley Receives DoD Civilian Service Award

Edward N. Dingley, Jr., Special Assistant to the Chief, Office of Research and Development, National Security Agency, was presented the Department of Defense Distinguished Civilian Service Award for outstanding contribution to the nation's defense.

This award was presented by Defense Secretary Charles E. Wilson in the first such ceremony ever held at the Pentagon. The award is made once a year to five Defense Department employees, chosen from hundreds who are nominated by the various departments and agencies within the Department.

Mr. Dingley, a member of AFCEA, received the award in recognition of scientific contributions he has made to the Defense Department. His inventions have resulted in invaluable improvements in the reliability and capacity of existing agency communication circuits, and in Government savings of over one million dollars.

Williams Succeeds Anderson At Automatic Electric

H. S. Williams has recently been elected a vice president of International Automatic Electric Corporation and placed in charge of its export activities in New York City.

In addition to his new duties, he will continue as vice president for domestic sales in the eastern district of the United States. He succeeds Vice Admiral W. S. Anderson, USN, Ret., who retires after more than ten years of service following his 46-year naval career.

Both Mr. Williams and Admiral Anderson have long been active in AFCEA activities, Admiral Anderson having served as president of the New York Chapter of the AFCEA in 1954.

Gaither Joins Magnavox

The Government and Industrial Division of the Magnavox Company, Fort Wayne, Indiana, recently announced the appointment of Colonel Loren E. Gaither, USA, Ret. as director of engineering of that division.

Colonel Gaither comes to Magnavox from the Evans Signal Laboratory of the Signal Corps Engineering Laboratories of which he was Director from 1951 to 1955.

During World War II he served as Signal Officer in the 14th Air Force, Tactical Air Command, in the China-Burma-India Theater and as Commanding Officer of 929th and 931st Signal Battalions. From 1948 to 1951 he was Technical Director of the American Forces Network.

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in accordance with CAA-FCC regs.
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— your most dependable source of Obstruction Lighting Equipment
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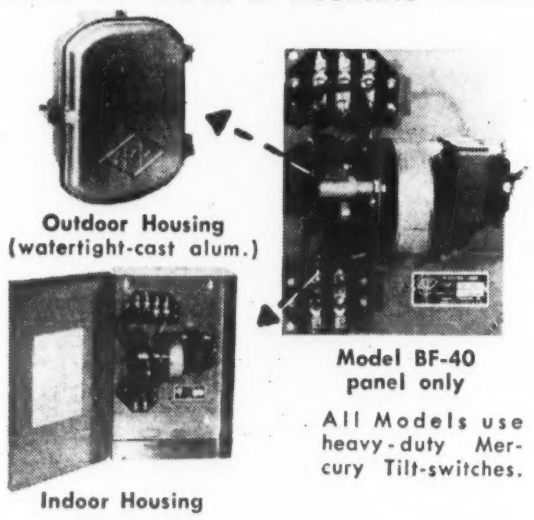

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PERSONNEL CLEARING HOUSE

AFCEA Members Available to Industry

The pages of SIGNAL are open to active AFCEA members who are seeking positions in the communications, electronics and photographic industries. Any member is entitled to space free of charge in this column for three issues of the magazine. Please limit your notice to five lines. In replying, employers are asked to address: Box ....., SIGNAL, 1624 Eye Street, N. W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

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Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

THE SPECIAL DEVICES CENTER, an activity of the Office of Naval Research, located at Sands Point, Port Washington, Long Island, has several vacancies for electronic engineers at $6390 a year, and one vacancy for a general engineer at $6390 a year which requires specialized experience in audio-visual recording. Inquiries should be directed to the Industrial Relations Officer. Telephones: Flushing 7-8300 and Port Washington 7-3800.

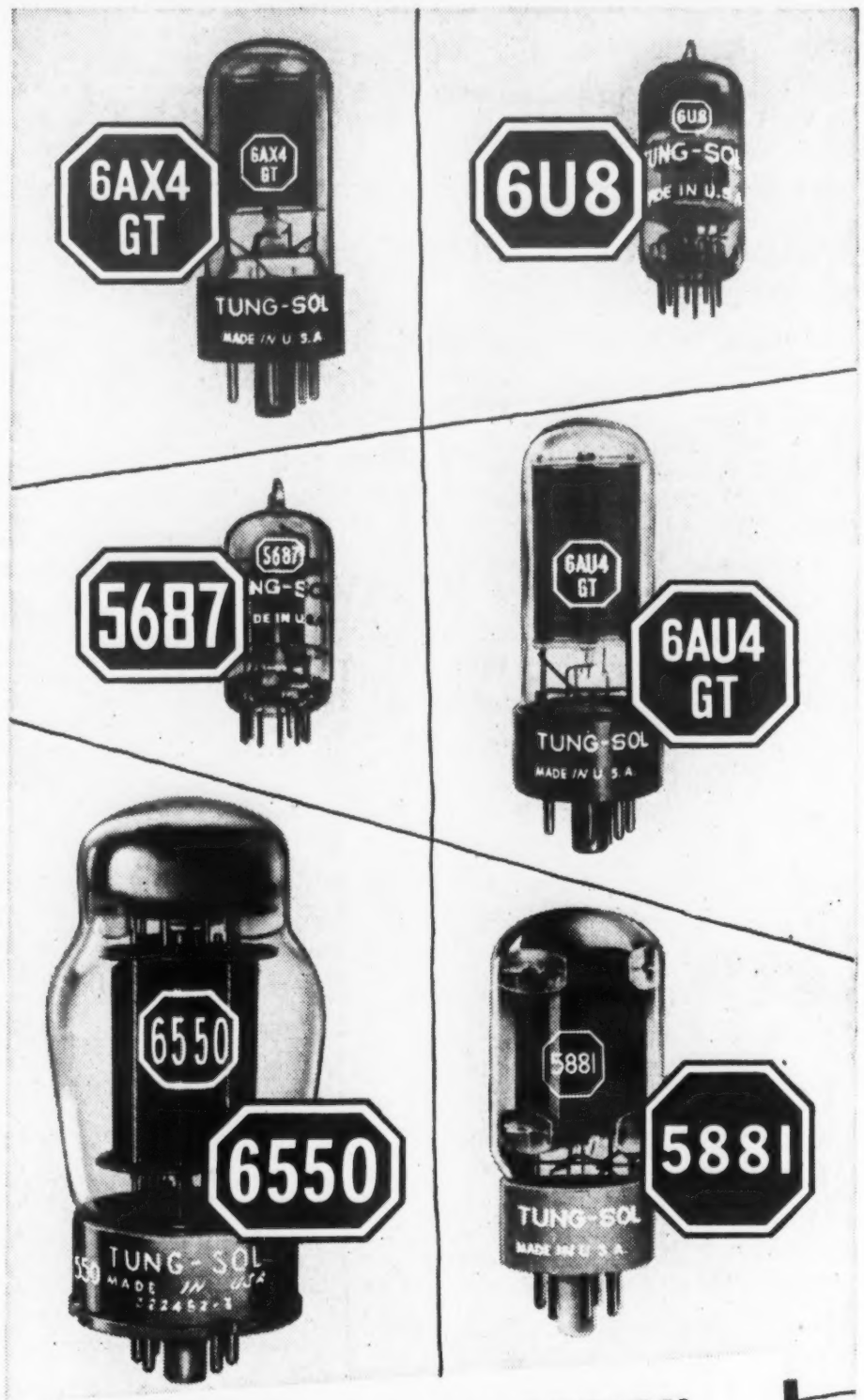
COMMUNICATIONS CODING CLERK (GS-4—$3,415/year). Applications are now being accepted by the U. S. Civil Service Commission for clerks with specialized experience in communications coding work. Applicants must have had at least one year of general clerical experience and one year of specialized experience, and are required to pass a written test. Apply to the U. S. Civil Service Commission, Washington 25, D. C.

ELECTRONIC SPECIALISTS are urgently needed at the Corps of Engineers Research and Development Laboratories, Ft. Belvoir, Va. Applicants must hold a degree in electrical engineering, physics or mathematics, or have considerable research experience in their fields. Salaries range from $4345 to $8940 per year, commensurate with education and experience. Apply to Walter H. Spinks, ERDL, Ft. Belvoir, Va.

RADIO OPERATOR TECHNICIANS. Veterans $3400-$4200 to start. Overseas opportunities. Amateur or commercial licenses helpful. Full pay during advance training. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, private training, work experience, FCC licenses—if any. Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

TELETYPE OPERATORS AND CRYPTOGRAPHIC TECHNICIANS. Veterans $3200-$3700 to start. Overseas opportunities. Full pay during training period. Good advancement opportunities. Submit resume with name, age, address, phone number—if any, military experience, FCC licenses—if any. Armed Forces Communications and Electronics Association will forward same immediately to employer who will acknowledge your application direct.

THE UNITED STATES CIVIL SERVICE COMMISSION has announced examinations for Microphotographer, $2,960 to $3,670 a year, Photostat Operator and Blueprint Operator, $2,960 to $3,415 a year, and Photographer, $2,960 to $4,525 a year, for filling positions in various Federal agencies in Washington, D. C., and vicinity. Appropriate experience or training is required. No written test is required for Photographer positions, but for the other positions, a written test will be given. Further information and application forms may be obtained at many post offices throughout the country, or from the U. S. Civil Service Commission, Washington 25, D. C. Applications will be accepted by the Commission in Washington until further notice.



OUTSTANDING IN DESIGN AND DEVELOPMENT

VERSATILE AND RELIABLE IN PERFORMANCE

ACCLAIMED BY THE ELECTRONICS INDUSTRY

TUNG-SOL ELECTRIC INC., Newark 4, N. J.

SALES OFFICES

Atlanta • Columbus • Culver City • Dallas • Denver
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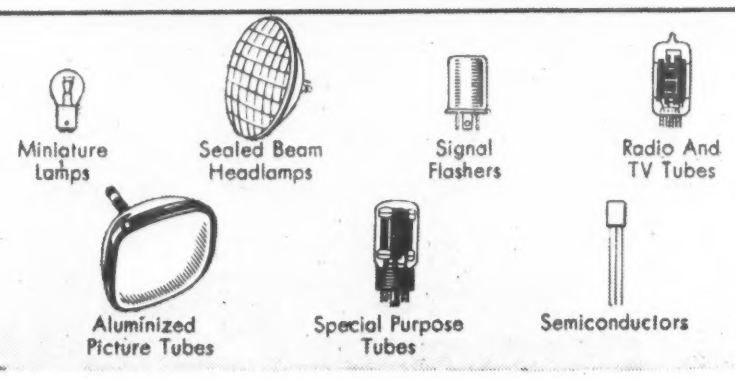
TUNG-SOL®

dependable

ELECTRON TUBES



NEW PRODUCTS FROM INDUSTRY

New Ceramic Magnets From Stackpole

A new low cost, ceramic, permanent magnet material has been developed by the Stackpole Carbon Company, St. Marys, Pennsylvania.

It combines adequate energy product with high coercive force, low residual induction, virtually 100% electrical resistivity and exceptional resistance to demagnetization. These unique characteristics, plus low cost and the non-critical nature of the ceramic, make magnets of this material well fitted for all ordinary permanent magnet uses as well as others of a more exacting nature, such as those where the magnets may be exposed to strong demagnetizing fields.

Known as Stackpole Ceramagnet permanent magnets, the new units retain their energy even when used without "keepers" or under other closed-circuit conditions, and in the presence of strong opposing fields. As an example, Ceramagnet cannot be demagnetized by another magnet of a force up to 2,000 gauss.

Ceramagnet magnets are practically non-conductors. They can be placed in the direct path of electromagnetic energy to rotate the polarization plane, to focus cathode ray tube beams or for similar purposes.

Complete engineering data on Ceramagnets, including graphs of essential properties, appears in the new Stackpole Ceramagnet Bulletin RC-10A. Copies are available on request to Electronic Components Division, Stackpole Carbon Company, St. Marys, Pennsylvania.

Goodyear Analog Computer

Goodyear Aircraft Corporation of Akron 15, Ohio, has announced another major contribution to the electronic differential analyzer field with the introduction of a new analog computer—the GEDA A14. This recent advancement combines practically unlimited linear and nonlinear computing capabilities with highest accuracy, greatest flexibility, and simplified operation.

In the single console configuration, up to 96 operational amplifiers and 50 or more nonlinear elements can be accommodated, providing one complete computing system or two independent smaller systems for widest flexibility. Multi-console systems provide larger capacities.

The nonlinear elements include units never before available. Among these are new high accuracy electronic multipliers, precision electronic resolvers, stabilized electronic map readers for functions of two variables, and variable-delay transport-lag simulators.

An outstanding feature of the new GEDA A14 is the built-in problem analyzer, which checks the actual wiring of a problem and the accuracy of coefficients both during and after the much simplified set-up procedure. An automatic dialing system provides for all selection and monitoring operations. Built-in circuits simplify the reading out of answers to extreme accuracies.

Tantalum Subminiature Capacitors

Designed specifically to meet the unique electrical requirements and dimensional limitation of extremely small equipment, a new subminiature series of Tantalum capacitors, Type NT, has recently been developed by the Cornell-Dubilier Electric Corp. of South Plainfield, New Jersey.

These new subminiature capacitors are available in a wide selection of ratings and sizes down to the most minute dimensions. Type NT capacitors are ideally suited for tight-fitting applications where stability and other favorable electrical characteristics plus minimum size are essential.

These applications include transistor circuits for hearing aids and miniature radio receivers, printed circuit assemblies, subminiature controls and other very small low voltage devices designed for operation within a temperature range of —20 degrees to 55 degrees Centigrade.

Wide-Band Frequency Synthesizer

A frequency synthesizer that generates a single frequency which is so accurate and stable that it may be used as a laboratory frequency standard has been introduced by the Federal Telephone and Radio Company, a division of International Telephone and Telegraph Corporation.

The instrument, designated as Type FT-XUA, generates a single frequency which is continuously variable from 30 cps to 30 mc. It is ideal for problems of filter engineering, testing of crystals, precision frequency metering and investigation of a variety of electrical elements where high selectivity and stability are required.

Frequency selection is carried out on three direct-reading decade scales which collectively yield the desired frequency without switchover. The output voltage can be adjusted accurately between 100 microvolts and 1 volt, a range of 80 db. Rejection of non-harmonic spurious signals is better than 60 db and harmonic distortion is less than 10 percent.

Complete details on the instrument are obtainable from the Instrument Division, Federal Telephone and Radio Company, 100 Kingsland Road, Clifton, New Jersey.

Servo Photometer

Servo Corporation of America, 20-20 Jericho Turnpike, New Hyde Park, Long Island, New York, is now manufacturing a Photometer, a device which will accurately measure radiation in selected spectral bands corresponding to various film types.

As well as displaying accurate dependable direct readings, the Model 1370 extends spectral coverage beyond the visible into both infrared and ultraviolet. This instrument is also applicable to color separation and analysis problems.

Since film response and correction filters are internally duplicated, direct stop and shutter speed readings eliminate scale changes, tables and computations. Selective fields of view permit distant measurement of the entire picture or specific highlights.

Self-powered, the Photometer is transistorized. Operating at any altitude, it is independent of ambient temperature variations.

Alden Tube Caps

Alden Products Company, Brockton, Mass., announces two new tube cap designs — one for high voltage arc-over and corona suppression — the other for suppression of corona and voltage insulation at high altitude and high temperatures.

Both of these new tube cap connector designs use a new Alden pro-

(*Continued on page* 80)

Tired of piece part and assembly problems?

LET General Mills SUPPLY THE WHOLE PACKAGE

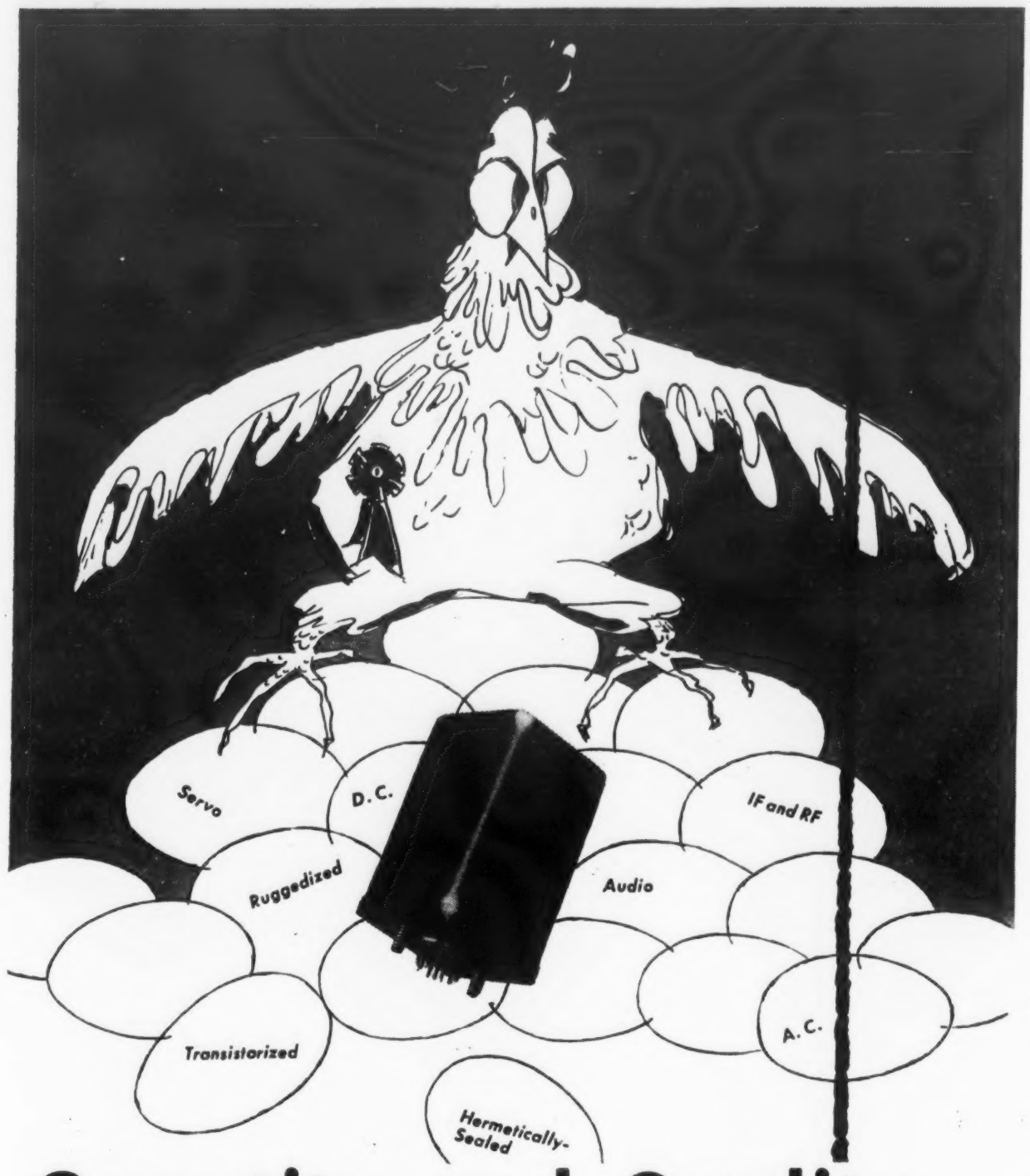
Save money, save time, save needless worry over hundreds of troublesome detail problems. Have those electro-mechanical assemblies you need precision manufactured, completely assembled and performance-tested by the Mechanical Division of General Mills.

We have the precision equipment and experienced people required to take over the entire job for you, from piece part fabrication or purchase to the finished product. As in our own prime contract work, we're geared to turn out precision assemblies *in quantity* while maintaining highest military standards of manufacture, design, quality control, packaging and accounting.

LET US BID on your requirements . . . write, wire or phone: Dept. S-3, Mechanical Division of General Mills, Inc., 1620 Central Avenue, Minneapolis 13, Minn. STerling 9-8811.

Job opportunities available for creative engineers. Work closely with outstanding men on interesting projects.

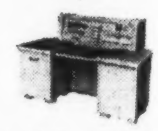
MECHANICAL DIVISION OF General Mills

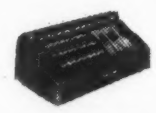


Quantity and Quality

IN PRODUCTION!

AMPLIFIERS UNLIMITED—Compact packaging . . . custom-like precision . . . volume production and time-table delivery is available for your defense amplifier projects. DuKane, a pioneer in electronic developments since 1922, will produce amplifiers in any size, capacity and production volume. A wire or phone call is all that's needed. Contact Government Division, DuKane Corporation, St. Charles 22, Illinois.


Central Sound System


Nurses' Call

Flexifone Intercom

Sound Slidefilm Projector

DuKane's commercial electronic products have established their superiority in schools, hospitals, factories and offices. Details available upon request.

Private Telephone

DUKANE CORPORATION ST. CHARLES, ILLINOIS

NEW PRODUCTS

duction technique, whereby the contact, lead, and corona shield assembly are molded as an integral insert into the insulating body, bonding the wire and connector insulation into one completely sealed unit.

The first tube cap is called the Alden Skirted Corona Shielded Tube Cap, which has been designed for use on the RCA voltage regulator tube 6BK4. It is used in the RCA Color TV circuit where it has passed their test for suppression of corona at 30 KV.

The other tube cap is called the Alden Insulated Corona Shielding Tube Cap with In-Line Resistor. This connector has the corona shield, contact, a resistor and lead molded as an insert into an insulating body of fluorothene. The design accommodates anything up to a 2 watt resistor.

Complete specifications on the new designs are available in the new Tube Cap Section of the Alden Handbook. For information write to Alden Products Company, NPR75, North Main Street, Brockton, Mass.

Electro-Thin Heating Elements

Electro-Flex Heat, Inc., 516 Asylum Street, Hartford 5, Conn., has announced its new Electro-Thin heating elements.

Measuring only .032 inches or less in thickness, they are designed for use in electronic equipment, crystal ovens and in other applications where excessive thinness is a requirement.

Elements can be produced in any plane shape and in any size required. Resistance variation offered is from 1.5 to 40 ohms per square inch.

ACF Encoder

ACF Electronics of Alexandria, Virginia, has recently introduced its Model 1050 Voltage Encoder, an all-electronic device which provides fast, precise and dependable conversion of analog voltages to binary codes.

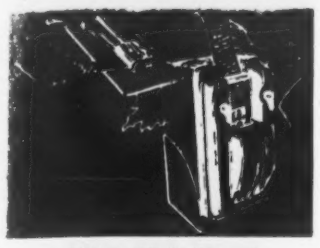
This encoder is asychronous and is capable of a conversion rate up to 15,000 ten-bit codes per second with a precision of 0.1 percent. It can translate the output of analog sensory devices into the binary numbers required in digital computing facilities used for real-time data processing, or for binary coded control applications.

The output of the ACF encoder can be modified to present the digital number either in parallel or serially with the most significant digit first.

(*Continued on page* 82)

Alfax Paper *in which* "ELECTRICITY IS THE INK" plus Alden Adjusterless Recording Techniques . . . Open Vast New Horizons in Direct Visual Recording

● NEW HORIZONS IN SPEED OF IDEA TRANSMISSION . . .

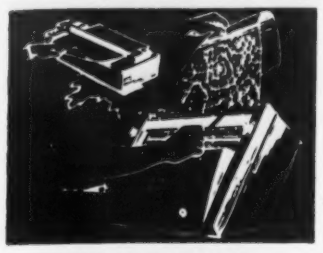


Alden High Speed Selective Dispatch System

The Alden High Speed Selective Dispatch System permits selection of pertinent data from any copy, letters, dispatches, and reports — for transmission at speeds up to 81 square inches (900 typewritten, 1800 newspaper words) per minute. Ideal for sending Vital Bursts of information and commands. Not only is the Alden System—using Alfax Paper—operated at high speeds but its high sensitivity allows large area bulletins to inform, teach or advertise—while being operated from remote positions—either permanently installed or quickly set up in the field.

Alden Giant Bulletin System

● NEW HORIZONS IN HIGH-DEFINITION FACSIMILE TRANSMISSION . . .



Alden High Definition Facsimile System

Alfax Paper and Alden Adjusterless Recording Techniques Provide Continuous, Automatic Hi-Fidelity Facsimile Transmissions

Weather Bureau Forecasters appreciate the clarity of weather maps recorded on Alfax Paper on which they can write—make notes—erasures and then proceed with their forecasting. Businessmen and advertisers appreciate the convenience of the automatic, flat-copy scanners on which anything can be transmitted without having to be rolled around a drum. The fine definition of recordings from this system permits transmission of practically any original from front elevation drawing, oil well logging, advertising layout, legal size documents, or strip by strip—the largest airplane or construction drawings. This equipment operates over ordinary telephone lines and without design changes at high speeds over microwave and the better telephone lines.

● NEW HORIZONS IN FACT FINDING . . .

FACT FINDING WITH GROUP A RECORDERS

2 Channel Recorder

30 Channel Recorder

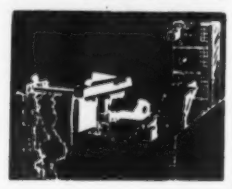
By converting phenomena into voltage and recording on Alfax Paper in either the 2 Channel or 30 Channel Recorders, it is possible to monitor and permanently record from two to thirty operations simultaneously.

FACT FINDING WITH GROUP B RECORDERS

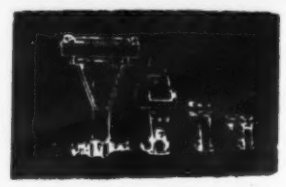
Great amounts of related information can be recorded accurately in a very small space using the Alden Adjusterless Helix Recorder. This complete line of recorders of all widths and speeds covers all possible recording requirements.

FACT FINDING WITH GROUP C RECORDERS

Group C consists of Group B Recorder with added electronics for such purposes as telemetering, all types of automatic and unattended recording from transducers, or plotting of any phenomena that can be converted to voltage.



ALDEN FLAT COPY SCANNING



All sizes of Alden Flat Continuous Scanners are not only used for transmitting messages at today's usual rates, but have the simplicity to operate at high speeds —equally important, they are used for scanning data recordings for re-analysis, the archives and/or computing.

● NEW HORIZONS IN RECORDING RESEARCH DATA . . .

Variations of the above equipment fill the void in a way to simply, instantly, and visually record pulses or wave forms that are too slow to show on an oscilloscope screen. Likewise at high speeds, photographing an oscilloscope (which, of course, is not instant recording) only records the light persistence of the fluorescence phosphors on the screen—whereas Alfax paper, operating directly from the pulses with all their *minute variations, can instantly record that which transducers can sense* through electronic gear which various scientists construct to work with Alden Recorders. With these recorders using Alfax Paper—supersensitive in the light shades—they are finding information which was often unsuspected or presented difficult problems in obtaining before the advent of Alden Recorders using Alfax Paper.

● NEW HORIZONS IN SIMPLIFIED UNIT DESIGN . . .

The Armed Forces and substantial business interests who plan to use the equipment made available by Alfax have seen such *far-reaching requirements for the equipment* that they have been concerned as to *how it is to be made* and *how it has been designed* to be *possible* to meet *simultaneously* the anticipated steep climb of *requirements in all the varied fields* where it is needed and called for . . .

● NEW HORIZONS IN ADVANCED TECHNIQUES OF MANUFACTURE & MARKETING . . .

This is why the Alden Research Center of 200 acres was established. Part of the program was kept under wraps until unit design and techniques were worked out for all the various combinations.

In general, new techniques of manufacture have been provided in which the equipment is built on Alden Systems Work Centers using straight line unit manufacture with unit design providing all the required combinations. Operations have been kept under wraps until the prototype became the mass production design and time was provided for reasonable field testing of equipment in each and every field of probable use.

AN INVITATION

is extended to you to visit Alden Research Center. If phoned in advance, arrangements can often be made to meet you at train or airport at Boston or Worcester.

ALDEN ELECTRONIC AND IMPULSE RECORDING EQUIPMENT COMPANY

WESTBORO, MASS.

SEE OUR EXHIBIT

If you missed seeing us at the IRE Show, Booths 185-191 see us at the Armed Forces Communications and Electronics Association Convention in Boston, May 24, 25, and 26, 1956, featuring our latest equipment.

NEW PRODUCTS

High sensitivity and freedom from overload resulting from large differences between the voltages being compared is achieved by employing nonlinear, negative feedback in a wideband, direct-coupler amplifier.

For further information write to Department 204, ACF Electronics, 800 North Pitt Street, Alexandria, Virginia.

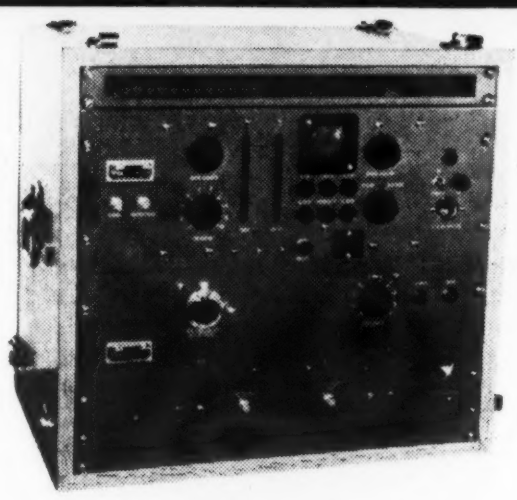
Automatic Tape Winder

A new Universal Model "Tape-Minder" for the communications and business machines industry has been announced by Cycle Equipment Company, 420 Market Street, San Francisco, Calif.

This new model should find a wide application for a variety of tape-producing equipment — teletype, ticker, automatic typewriter, accounting machines and computers.

Three sizes of winding reels are available and are interchangeable on the basic machine, making the machine useful for changing requirements. Reels are quick-threading, instantly removed or replaced and available with either large cores for re-transmitting (unwinding) or small cores for filing.

EC-250 BINARY SYSTEMS ERROR COUNTER



Consists of Keyer Oscillator and Error Detector.

Exceptionally stable oscillator produces keyed pulses at rates equivalent to 2 to 32 channel multiplex systems.

Detector compares received pulses with locally generated identical pulses.

Write for specifications.

RIXON ELECTRONICS, INC.
2414 Reedie Drive
Silver Spring, Maryland

An exclusive operating arm coupled to a long-interval on-off switch provides delayed-action winding which operates the fan-cooled motor only one-sixth of the total operating time. This same operating arm is built integral to a clutch release mechanism which permits an operator to spin the reels for back reference.

Thyratron For Pulse Modulation

Penta Laboratories, Inc., of Santa Barbara, California, has announced the availability of the new PL-161 hydrogen thyratron for pulse modulator service.

The new tube carries the ratings of the well-known PL-5C22, but is two inches shorter than the prototype. By using a compact, rugged 7-pin stem and eliminating the conventional base, Penta has reduced by 25 per cent the space occupied by the tube while retaining full performance characteristics.

Maximum ratings of the PL-161 are: peak plate voltage, 16 kv; peak plate current, 325 amperes. Maximum dimensions are: overall height, 6.25 inches; diameter, 2.56 inches.

RCP Transistor and Tube Tester

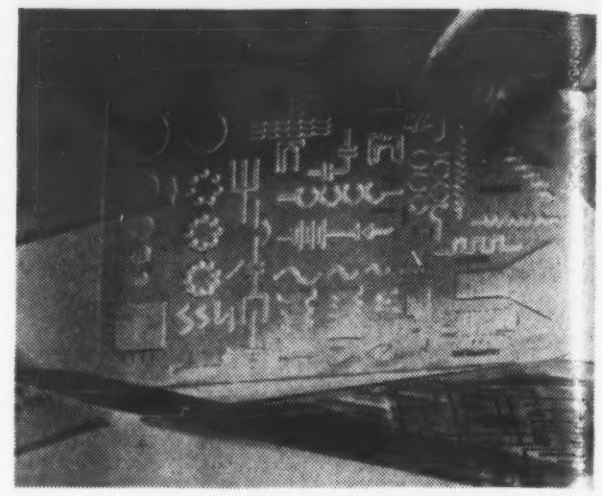
A new combination tube and transistor tester recently announced by Radio City Products Company, is said to combine all of the important functions of costly laboratory-type instruments with the versatility and low cost required for radio and television servicing.

Known as the RCP Model 325, the new instrument accurately tests N-P-N and P-N-P type transistors as well as all radio and television tubes —including magnetically-deflected black-and-white and color picture tubes, and all series-string heater types.

Potentially weak, gassy, or low-gain tubes can quickly be spotted by this tester when conventional tube testers would indicate "okay." As an added safety feature, the meter always reads "line voltage" until one of the two "test" switches is pressed.

The RCP Model 325 tests all commercially used transistors under actual operating conditions. Current amplification is accurately measured using a constant-current bridge and low-impedance power supply.

Full specifications are available from Radio City Products Company, Distributors Division, 26 Rittenhouse Place, Ardmore, Pennsylvania.



Shown above is the new transparent vinyl template diagrammer, manufactured by A. Lawrence Karp of Greenwich, Connecticut. This diagrammer makes any radio, television or electronics circuit drawings with pen, pencil or stylus.

Electronics Diagrammer

A new electronics diagrammer which eliminates the need for all other drafting instruments is now being manufactured by A. Lawrence Karp, 16 Putnam Park, Greenwich, Connecticut.

This new diagrammer makes it possible for persons with no drawing experience to make professional looking circuitry plans in a matter of minutes by running a pencil, pen or stylus through any combination of its dozens of sharply engraved electronic symbols.

Every necessary component of the most commonly used electronic symbols is included on the rigid transparent vinyl template, which measures only 4¼ inches by 6½ inches by .040. The sides of every symbol are beveled to provide extreme ease and accuracy. These symbols include the usually tedious-to-draw pronged tube bases, cathode ray tubes, resistors, elements and coils.

Miniature Ruggedized DC Millivoltmeter

A new low-level DC vacuum tube volt meter, small enough to be built into any equipment panel, is the latest addition to the Trio Laboratories, Inc., line of miniature, panel-mounting instruments.

Designed to meet appropriate military specifications, including MIL-T-945A and MIL-E-5400, Trio's Model J reads from 500 microvolts to 300 volts DC with an accuracy of 2 per cent of full scale.

Developed for panel mounting by means of four self-locking threaded inserts, it is ideal for field tester use and for built-in monitoring and trouble-shooting of operational equipment. Both signal leads are isolated and shielded from power circuits, instrument case, and chassis ground so that voltages can be measured be-

(*Continued on page* 84)

MARCH
19 - 22

How BIG must the show be?

When a facetious critic asked, "How long should a man's legs be?" Abraham Lincoln replied, "Long enough to reach the ground!"

The 1956 Radio Engineering Show is big only because it *must be big* to be truly representative of a gigantic industry. 704 exhibitors, 1 out of every 5 firms manufacturing for the industry, will be present.

But these 704 firms represent over 80% of the industry's production. A smaller Show would give only an inadequate picture of the year's progress and new developments.

Being BIG pays off! This truly great event brings out the best...in people, effort and products!

Registration—IRE Members $1.00
Non-members $3.00

What you get out of it!

- You see what is new in radio-electronic products and engineering!
- You meet the men who make these products!
- You save time...seeing in days a whole year's productive effort!
- You hear the best technical papers in subjects of your own specialty!
- You meet old friends and make new ones, enjoy association and social events!

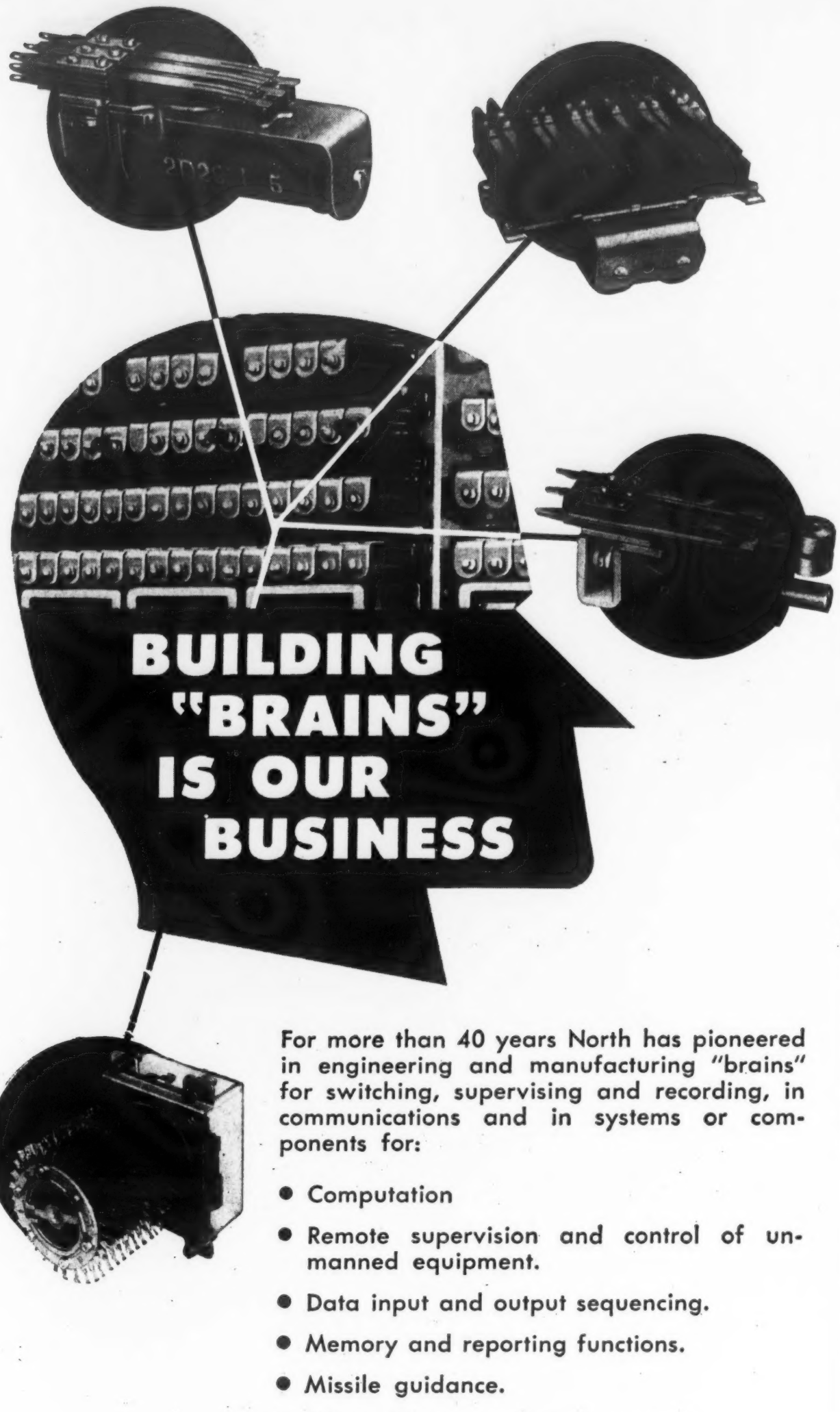
The IRE National Convention

Waldorf Astoria Hotel, New York City

and RADIO ENGINEERING SHOW

Kingsbridge Armory & Palace, New York City

®



For more than 40 years North has pioneered in engineering and manufacturing "brains" for switching, supervising and recording, in communications and in systems or components for:

- Computation
- Remote supervision and control of unmanned equipment.
- Data input and output sequencing.
- Memory and reporting functions.
- Missile guidance.
- Other airborne automatic controls.
- Many other "automations."

When you must meet critical industrial or military specs which go beyond the usual meaning of "dependability" call on North to collaborate in or take over your problems.

Our field engineers are strategically located in the important industrial areas.

NORTH ELECTRIC COMPANY

INDUSTRIAL DIVISION 455 S. Market Galion, Ohio

NEW PRODUCTS

tween any two independent test points.

Many variations of the standard instrument can be provided, including extra signal terminals on the front panel, zero-left meter indications, white-on-black or other special scale plates, special ranges, etc. For additional information, contact Trio Laboratories, Inc., 3293 Seaford Avenue, Wantagh, L. I., New York.

Mercury Plunger Relay

The Ebert Electronics Corp. of Queens Village 28, New York, have introduced the midget Minirelay, a device claimed to be the smallest Mercury Plunger Relay available.

This newest addition to the Ebert line is reported capable of handling any load up to 20 amperes or 1.5 Hp. at 115 volts, 50/60 cycles, and is so compactly constructed as to require a minimum of space. It has an extremely fast action of approximately 30 milliseconds to make or break.

Measuring only 3½ inches high by 1¾ inches wide by 1½ inch deep, the Minirelay has been designed for compact multiple arrangements and for ease of installation. This development in the controls field is specifically designed for today's miniaturization trend in the electronic, electrical and appliance industries.

It is said to have all the advantages of standard 35-ampere and heavy duty 60-ampere mercury relays in a unit less than half their size. The 20-ampere rated Minirelay has a load capacity twice that of ordinary armature-type mechanical relays of equal size.

The Minirelay mercury-to-mercury contacts are totally enclosed in hermetically sealed heavy industrial glass for safe, silent operation even in explosive, dusty, dirty or moist atmospheres where open-type mechanical relays are inadvisable.

Polymer Ferromagnetic Plastic

A new ferromagnetic plastic in the forms of flexible rod and tape is being introduced by The Polymer Corp., Reading, Pa.

Both the flexible and rigid materials are said to be suitable for continuous operation to 200°C. They offer resistance to severe humidity conditions, very high impact strength, good machinability, high volume resistivity and positive "Q" temperature coefficients.

Polymer reports that the new flexible forms permit better use of in-

(*Continued on page* 86)

NOW

IRC resistance strips and discs

IRC Resistance Strips and Concentric Disc Resistors offer unusual adaptability to special requirements. They consist of a high grade paper-base phenolic sheet to which IRC resistance material is permanently bonded.

Resistance strips can be used as supplied by IRC, with either side or end termination, or they can be further processed by the user to form particular shapes for individual requirements. Use coupon for detailed data on specifications and characteristics.

TYPICAL APPLICATIONS

IRC RESISTANCE STRIPS

IRC RESISTANCE STRIPS ARE USED EXTENSIVELY IN:

- Strain Gauges
- Servo-Mechanisms
- UHF Attenuators
- Telemetering Equipment
- In conjunction with Wave Guides

IRC CONCENTRIC DISC RESISTORS

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herent magnetic properties, thus enabling the design of smaller and more efficient electronic components. This is possible because they permit the design of magnetic circuits essentially within a magnetic atmosphere.

The flexible material, known as Ferrotron, has been tested as a highly useful material for improved delay line construction. Other indicated uses include: combined insulation and core material around and between the windings of transformers, chokes and similiar inductors; elecro-magnetic shielding where isolation around emissive components is desired, and a magnetic base or overlay for printed circuit inductors.

Electronic Contact Printer

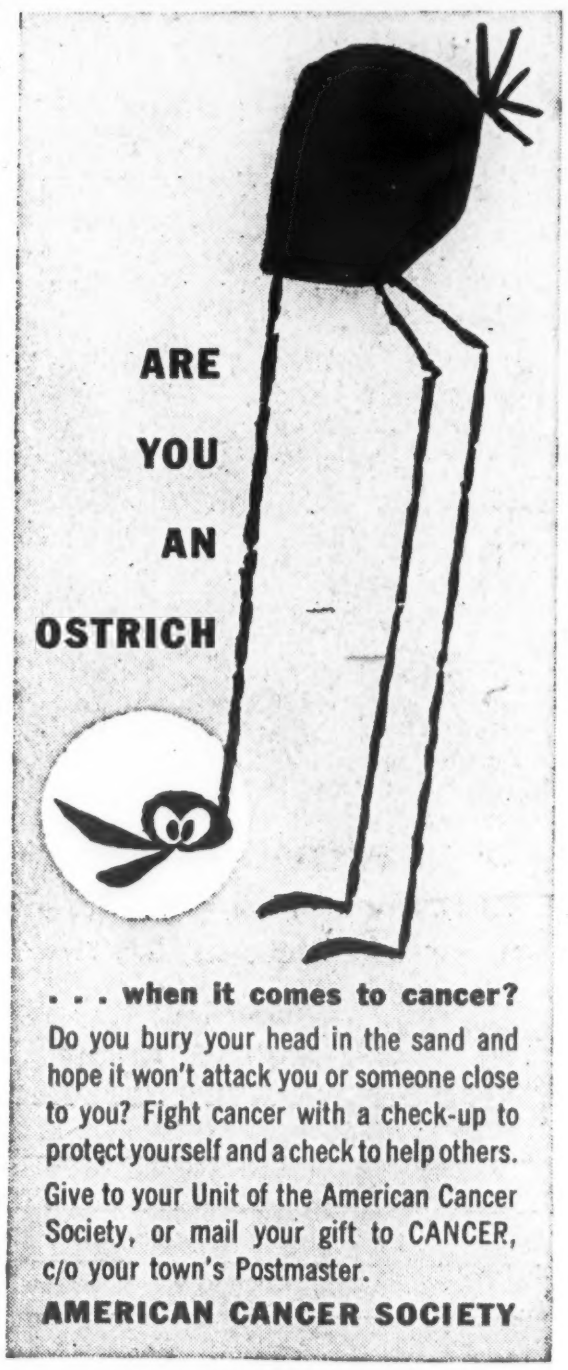
An electronically controlled photographic printer is now available from Logetronics, Inc., 1177 New Hampshire Avenue, N. W., Washington 7, D. C.

Unlike conventional printing, the intensity of exposure is varied in Logetronic printing for each of the thousands of minute picture areas within the negative in relation to their respective densities.

The printer, Model CP-10-S, makes possible a completely automatic device for producing uniform exposures from each portion of the negative, in one step, without relying on operator judgment — in short, a photographic printer with automatic "dodging" and exposure control.

The Logetronic printer uses a single cathode ray tube as the printing light source, a stationary photo cell to sense the light which passes through the negative, plus a feedback loop through which the photo cell continuously controls the intensity of the scanning light source.

Housed in an aluminum cabinet, it weighs 175 pounds and measures 71¼" high, 41½" wide and 21" deep. It operates on 110 volts, 60 cycle, single phase alternating current and consumes 3 amperes.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16 Channel Multiplex Terminal System

Rixon Electronics, Inc., 2414 Reedie Drive, Silver Spring, Maryland, has developed a 16-channel "time division" multiplex terminal system for use primarily with VHF communications equipment. Designated as the MUX-16, the first complete system is scheduled for delivery in April.

A complete system, including transmitter code converters, receiver code converters, control units, power supplies and test facilities, is contained in a dual relay rack cabinet which is 84 inches high. The equipment is designed for 115-volt 60-cycle operation and has a total power consumption of under 500 watts.

The system is designed for 60, 75 or 100 wpm teletypewriter operation. Current required to operate the teletypewriter equipment at both the receiver and transmitter ends of the system is furnished by the MUX-16. The equipment is capable of 2, 4, 8 or 16 channel operation. Changing the number of channels can be accomplished without losing synchronization by merely flicking a switch.

Synchronization between the transmitting and receiving sections of the MUX-16 is maintained over a long period of time by oscillators with a high degree of stability. Other design features include automatic phasing, simplified channel switching interchangeability of sub-assemblies.

Bias and Distortion Meter

A Bias and Distortion Meter, Model RE-746, a versatile instrument for use in communications rooms for the measurement of transmission efficiency of circuits, has been developed by Railway Electronics, Inc., 238 Huguenot Street, New Rochelle, N. Y.

Direct meter readings indicate the percentage of bias and distortion in circuits without interrupting message traffic. These readings detect marginal circuits, thus reducing transmission errors and eliminating possible circuit failures.

The meter can be used in the D.C. side of carrier channel terminals, main line sections of open wire circuits and in the loops of repeatered circuits. An arrangement is provided in the meter to check transmitting and printing equipment.

For the Photographer

Du Mont Oscillograph-Record Camera

The only oscillograph-record camera to be specifically designed for use with a 3-inch cathode-ray oscillograph has been introduced by Allen D. Du Mont Laboratories, Inc., 750 Bloomfield Avenue, Clifton, New Jersay.

Designated the Du Mont Type 339 Oscillograph-Record Camera, it offers full binocular vision, is self-supporting, and produces prints one minute after exposure.

The camera incorporates a Polaroid-Land back and produces a 2¾ inch by 3½ inch black and white print 60 seconds after exposure. A Wollensak f/2.8, 50mm anastigmatic lens is provided in this model. The correction is sufficient to resolve and record with negligible distortion any pattern over the useful screen area of a three-inch cathode-ray tube.

It is expected that the lens will enable writing rates up to one-inch per microsecond from a Du Mont-type 3WP11 screen with 1,500 volts acceleration and using Type 31 film. The focus is factory adjusted for use with a flat-faced cathode-ray tube, but for the sharpest possible focus in special application, the lens setting can be adjusted by loosening two set screws.

New Photographic Lighting Unit

A new lighting unit specially designed for the production of shadow free photographs in laboratory, studio and engineering applications has been introduced by the Hinelight Corporation, 2500 John Street, Fort Wayne, Indiana.

This unit reduces shadow through the use of a graded circumferential tube light arrangement which places the camera lens inside the light source.

(*Continued on page* 88)

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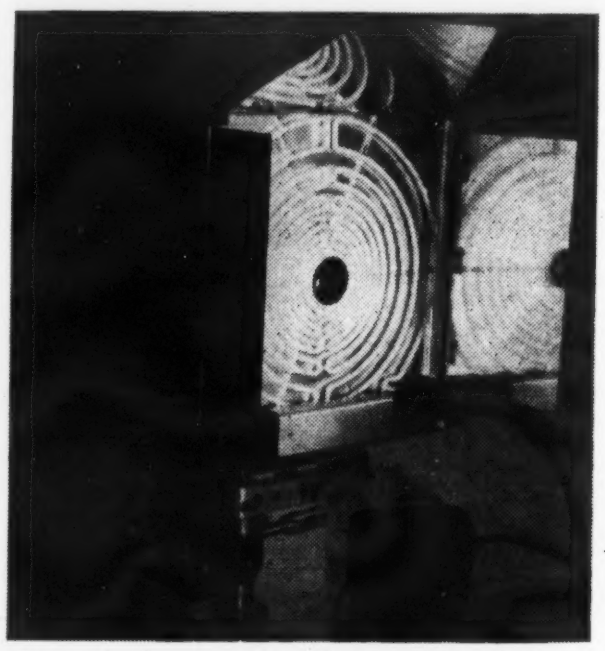
NEW PRODUCTS

Basically, the unit consists of an exponentially graded tube light and enclosures with reflective background and reflective wings; interconnecting cables, relays and switches; a high voltage operating transformer, and camera adapting brackets. Any high quality back-focusing view camera or 35mm equipment may be used.

The graded light principle of the unit reduces light intensity as the radius from the camera lens is increased, so that any shadow produced is visually negligible. Light distribution is virtually flat, instead of hemispherical, so that practically equal light is produced over an angle of 40 degrees.



Pictured above is the photographic lighting unit designed for the production of shadow free photographs. This device is a product of the Hinelight Corporation of Fort Wayne, Indiana.

Graflex Stroboflash

Multiple varieties of light output are now possible with the new Graflex Stroboflash IV electronic flash, featuring an exclusive "4-way power selector."

Introduced recently by the Strobo Research Division of Graflex, Inc., 154 Clarissa St., Rochester 8, N. Y., this portable unit can be used for a wide number of photographic assignments. A flick of the control switch provides 50, 100, 150, or 200 watt-seconds output—a full range of light control which lets the user select the best light level.

Because of the variety of light output possible, the photographer can take closeups with fast film or long shots with color film; vary exposure without changing "f" stops; balance multiple light sources for delicate lighting effect; and increase action-stopping ability by reducing output setting.

There is no wasted power when using the unit. The capacitors not needed are automatically cut off. Besides conserving battery power, this also permits faster re-cycling time between flashes. The Stroboflash IV can be left on for hours, ready for instant action, with little loss of battery power.

New Literature

Bendix Releases Study On 'Copter Navigation

As an important contribution toward the eventual establishment of a firm set of specifications for a helicopter navigational aid, the Bendix Aviation Corporation has published a report entitled "Helicopter Navigational Requirements." This study was prepared for Bendix by the Stanford Research Institute of Menlo Park, Calif.

The report contains a great deal of information, some completely new, which will be of interest to anyone in the field of helicopter navigation and traffic control. An attempt is made to establish the limits of the allowable navigation error during en-route and approach situations with the New York area as a model.

Factors of time and economics as they are affected by operations over various suggested helicopter routes are analyzed. A typical military mission is also investigated, and a method of operation is suggested and navigation accuracy requirements are determined. Market factors regarding helicopter navigation aids are presented as a guide to future sales planning.

A limited number of copies of the study are available to qualified people in government agencies, technical committees, military services and the helicopter industry in general. Those desiring copies should address Bendix Aviation Corporation, Pacific Division, 11600 Sherman Way, North Hollywood, California.

Andrew Catalog

Andrew Corporation, designer and manufacturer of antennas, antenna systems and transmission lines, has recently produced a comprehensive catalog, devoted to this segment of broadcasting and communications.

This 100-page catalog contains product description and engineering data on over 500 of their products. Twenty pages are devoted to system engineering data and related information that engineers specializing in this field of electronics will find informative.

The catalog is available upon request to the Andrew Corporation, 363 East 75th Street, Chicago 19, Ill.

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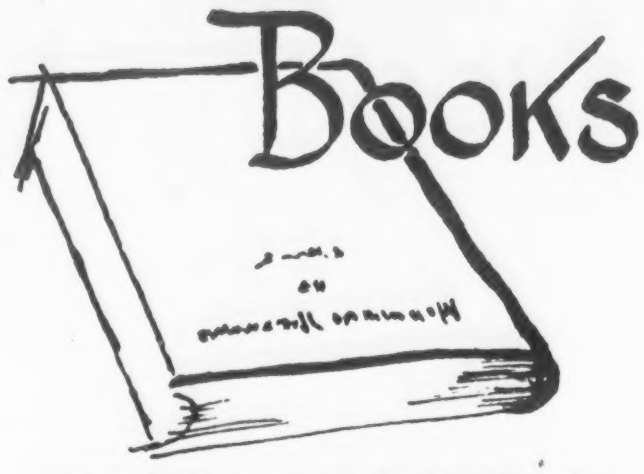

TELEVISION—HOW IT WORKS, 2nd Edition, by J. Richard Johnson. John F. Rider Publisher, Inc., New York, N. Y., 352 pages, $4.60.

It is the function of this book to explain the how and why of modern television receivers in the simplest and most direct terms, and yet in a complete and professional manner. It is designed for the service technician. the television student, the experimenter or hobbyist, and any of the thousands of people who are interested in how television works. The only prerequisite is a rudimentary working knowledge of electricity and radio circuits.

The text is equally apt for either home or formal school courses. Because the treatment covers the latest circuits and principles applied in television receivers, it will be found especially useful to the radio or television man who wishes to bring his previous knowledge up to date.

Since television receivers first became available in large numbers, the design of these receivers has progressed rapidly toward greater efficiency, compactness and low cost. The recent tendencies of the modern monochrome receiver circuit to stabilize to a certain extent have made it possible to make this book quite universal in its scope and somewhat lasting in its timeliness, as well as practical in its slant and language.

ELECTRONIC ENGINEERING, by Samuel Seely. McGraw-Hill Book Company, Inc., New York, N. Y., 525 pages, $8.00.

This book has as its objective a detailed discussion of a large variety of electronic circuits which are important in such fields as radar, television, computers, electronic control and instrumentation. Those circuits which have found applications principally in the field of radio are not included in this book, though a number of circuits of interest both in radio and non-radio applications are included.

Most of the text is devoted to the analysis of circuit operation. However, some of the factors that must be considered in circuit and system synthesis are discussed.

The book begins with a general introduction to tubes and tube circuit principles, and then proceeds into a detailed consideration of the more important electron tube circuits. Emphasis is placed on the physical and mathematical analyses.

In all analyses, considerable care has been taken to include the requisite reference conditions for potential polarities, current directions, and transformer-winding sense. Although most of the text is devoted to the analysis of circuit operation, some of the factors that must be considered in circuit and system synthesis are also discussed.

Because one of the purposes of this book is to train the reader in techniques of analysis, occasional alternate methods of analysis of a given circuit are included and varied analytical methods are employed in developing the material. Examples and problems are used to relate the theoretical developments with practical situations.

Although this book, together with its companion volume *Radio Electronics,* is a revision and enlargement of the author's *Electron Tube Circuits,* both books are written as self-contained, independent texts.

SPHEROIDAL WAVE FUNCTIONS, by J. A. Stratton, P. M. Morse, L. J. Chu, J. D. C. Little, F. J. Corbato. The Massachusetts Institute of Technology and John Wiley & Sons, Inc., New York, New York, 613 pages, $12.50.

In the past twenty-five years, the wave equation has come to have a steadily increasing importance in theoretical physics. In addition to the increase in practical importance of the classical fields of acoustics and electromagnetic theory, the new and fundamental field of quantum mechanics has come into being.

This book makes it possible for the electrical engineer and physicist to handle wave problems in spheroidal coordinates with approximately the same degree of facility as has been possible previously for rectangular, circular, cylindrical, and spherical coordinates. The availability of these tables makes certain calculations in applied physics, acoustics, and radar much more practicable.

This volume deals with those spheroidal wave functions appropriate for prolate or oblate spheroidal boundaries. It defines certain standard forms of their solution which are useful in practical problems, and it displays a collection of formulas giving the important mathematical properties of these functions.

Included also is a set of tables from which values of the solutions can be obtained for the more interesting ranges of the variables. These tables contain the series coefficients, together with some of the separation constants.

All the numbers contained in the tables were determined by the high speed electronic digital computer Whirlwind I at the Massachusetts Institute of Technology. They were computed, tabulated and printed automatically, thus permitting a degree of reliability never before achieved in an undertaking of this nature with functions of this complexity.

INTRODUCTION TO TV-SERVICING, by H. L. Swaluw and J. Van Der Woerd. Phillips' Technical Library, Houston, Texas, 276 pages, $5.50.

This book has been written specially for those radio service technicians having a sound knowledge of circuit fundamentals and practical experience who wish to prepare themselves for television servicing.

The material is presented in such a way that most radio servicemen will have no difficulty in following the authors' reasonings and explanations. The experienced serviceman will quickly grasp the procedure for adjusting the internal and external controls of the television receiver, making the relative mechanical adjustments and carrying out the simple repairs.

A number of simple faults account for more than 50% of the total faults which can occur in TV receivers. It is possible to effect these simple repairs with the aid of a limited amount of test equipment.

A technical introduction is given before proceeding with the discussion of practical problems. This section of the book consists of a short explanation of the scanning system, the working of the picture tube and of the waveform of the television signal. This is followed by a few chapters with an extensive description of a modern receiver with separate sound channel (split-sound receiver). Two chapters are devoted to modern developments, namely intercarrier sound and the turret tuner with cascode amplifier.

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General Almond

Lt. General Edward M. Almond, United States Army Retired. Commander 12th Machine Gun Bn. 4th Inf. Div. in the Aisne-Marne & Meuse-Argonne offensives during World War I. Awarded Purple Heart and Silver Star during these conflicts.

Professor of Military Science and Tactics, Marion Institute, Marion, Ala. 1919-1923.

Chief of Staff VI Corps, 1942.

Commander 92nd Inf. Div. July 1942—Aug. 1945.

Commander 2nd Inf. Div. 1945-1946.

Chief of Staff to General Douglas MacArthur in General Headquarters, Far East Command 1949.

Chief of Staff for United Nations Command.

Commander X Corps in the Inchon Landing and other campaigns in Korea.

What Others Say . . .

COLONEL ALVIN M. OWSLEY, Past National Commander, American Legion: ". . . one of the great documents of our times. A factual account of those who betrayed our country and how the sell-out was brought about. A strong denunciation of those who would destroy us and a valiant support of the principles and ideals, honesty and morality that can save us as a Nation."

SENATOR WILLIAM A. LANGER, former Chairman, Senate Judiciary Committee: "I think it ought to be compulsory reading in every public school in the United States."

J. M. HAZLITT, syndicated columnist: "The most startling, challenging and alarming writing of the past 50 years. Things in your own memory, which seemed paradoxical and puzzling at the time, will shine forth as pieces that fit the pattern."

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Mr. John Beaty
1717 Wood Street
Dallas, Texas

Dear Mr. Beaty:

I have just finished reading your valuable contribution to a true concept of American patriotism entitled "The Iron Curtain Over America."

It is an inspiration to me to find an author with the courage and energy to research, to state in print, and to secure the publication of such information as you have assembled in order that the poorly informed average American may know wherein the real threats to our Country lurk.

My duties during World War II and the period thereafter until my retirement from the Army in 1953 precluded my having the time to study and to understand the political machinations that transpired during the tragic twenty-year period of which you have written.

In my association with General MacArthur from 1946 until 1951, in Japan and in Korea, I was aware of the Truman aspects of our Japanese Occupation and Korean War frustrations. But it is only through your book that I have come to understand the situation that prevailed in all of its alarming aspects here in this country.

I congratulate you upon your forthright expose' of the actual conditions under which many of the international agreements of which you write took place during the period 1932 to 1952. Your book is a magnificent and patriotic contribution to those who would preserve our American ideals.

Sincerely yours,

Edward M. Almond

Edward M. Almond
Lieut. Gen. USA (Ret)

EMA/jn

THE IRON CURTAIN OVER AMERICA

by COLONEL JOHN BEATY

THE BOOK THEY COULDN'T SUPPRESS

The forces of Communism and Leftism tried to suppress this book through the control they exercise over the book sections of so many newspapers and periodicals and retail book dealers. "It is a reflection on our press and great publishing houses that this book has received little or no mention among book reviews, and that every effort is being made to stop its distribution and sale," said General George Van Horn Moseley, USA (ret.).

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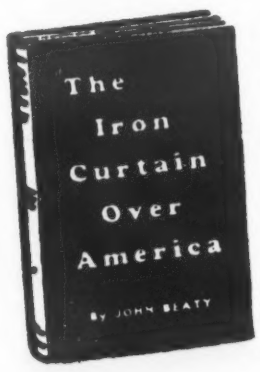

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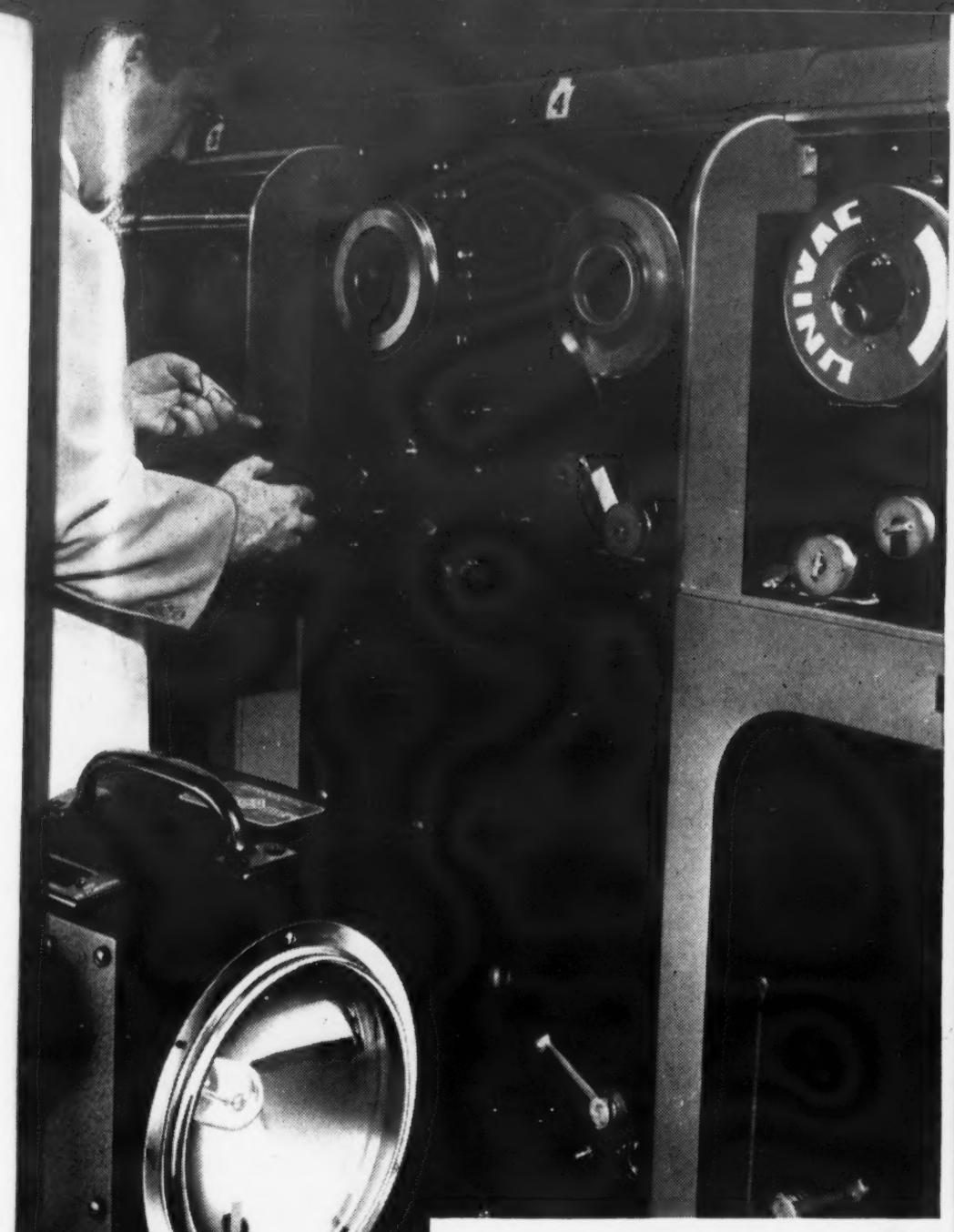

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Four internal dry cells are the d-c power source and drive a 1000-cycle hummer for a-c measurements. A zero-center galvanometer is used for d-c balance; terminals are provided for external headset (not supplied with instrument) for a-c null detection.

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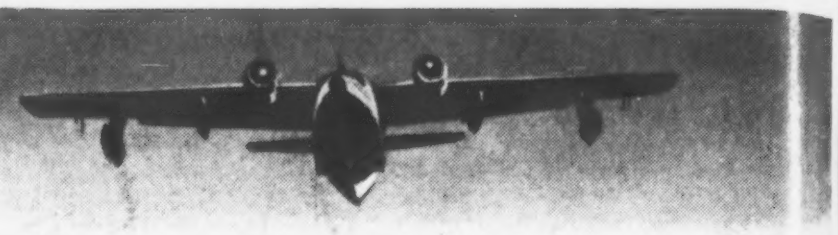

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